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THE REVIEW
OF
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Pflanzliche Virusforschung. Vorträge gehalten anlässlich der Einweihung des neu errichteten Dienstgebäudes der Abteilung für pflanzliche Virusforschung der Biologischen Bundesanstalt Braunschweig am 23. Februar 1954. [Plant virus research. Lectures delivered on the occasion of the inauguration of the recently erected building of the Department for Plant Virus Research of the Biological Federal Institute, Brunswick, on 23rd February, 1954.]—*Mitt. biol. ZentAnst. Berl.* 81, 51 pp., 2 pl., 10 figs., 1954.

Up-to-date information on the following aspects of virus research was presented in the four lectures reproduced in this booklet: virus diseases of plants; development and present status of their investigation, by E. KÖHLER (pp. 13–24); the importance of herbaceous plants in virus dissemination, by H. A. USCHDRAWEIT (pp. 25–33); importance and results of serology in virus research, by R. BERCKS (pp. 34–42); and the electron microscope in the service of plant virus research, by O. BODE (pp. 43–51).

Most of the work referred to has been noticed from time to time in this *Review*.

VANDERWALLE (R.). **Observations et recherches effectuées à la Station de Phytopathologie de l'État pendant l'année 1953.** [Observations and researches carried out at the State Phytopathological Station during the year 1953.]—*Bull. Inst. agron. Gembloux*, 22, 1–2, pp. 142–154, 1954.

In this report on plant diseases in Belgium [cf. *R.A.M.*, 25, p. 152] it is stated that wheat bunt (*Tilletia nuda tritici*) [*T. caries*: 32, p. 550] was again very prevalent, up to 10 per cent. of the ears being affected in some crops in the province of Luxembourg. Many plantings grown from treated seed became diseased. Maize smut (*Ustilago maydis*) [C.M.I. map No. 93] was less prevalent than in 1952, but severe local outbreaks occurred in different parts of the country. There were heavy losses of potatoes, especially the Bintje variety, from blight (*Phytophthora infestans*) [*R.A.M.*, 26, p. 351]; the disease appeared on 1st July, and massive infection occurred a week later. Spraying gave effective protection.

Beet yellows virus [32, p. 530] was general throughout beet-growing areas, but was less severe and occurred later than in 1952. Black leg (*Mycosphaerella tabifica*) [*Phoma betae*] increased in intensity in the province of Liége. Primulas were affected by cucumber mosaic virus [cf. 31, p. 220], and the disease was observed to be spreading. Damage of some importance was caused to poplar seedlings in nurseries by *Dothichiza populea* [30, p. 216]. One important outbreak of *Gnomonia tiliae* [cf. 15, p. 74] on lime trees was reported. A species of *Cladosporium* was severe on chrysanthemum.

In the section on research it is reported that the viability of the chlamydospores of *Ustilago nuda tritici* [*U. tritici*] and *U. nuda* is perfectly preserved over a period of years by vacuum-drying.

Experimental evidence demonstrated that the artificial floral infection of cereals

with smut [*Ustilago* spp.] by the wet method results in irregular degrees of infection as between the ears of any one line and the spikelets of any one ear. The irregularity in the manner of appearance of diseased plants in the glasshouse or field results from this irregularity of infection and from the development of latent infections. Further research is needed into the optimum conditions required for securing maximum infection by artificial means.

Chemical and physical techniques were devised for rendering cereal embryos transparent, so that after staining, smut mycelium is visible through an ordinary magnifying glass, thus enabling the real level of infection in the seed to be determined.

SCHREIER (O.). **Das Auftreten wichtiger Schadensursachen an Kulturpflanzen in Österreich im Jahre 1954.** [The occurrence of important causes of injury to cultivated plants in Austria in the year 1954.]—*PflSchBer.*, 14, 1–4, pp. 23–33, 1954. [English summary.]

A list is given of the diseases (mostly common) affecting cultivated plants in Austria in 1954 [cf. *R.A.M.*, 33, p. 523], when new records included *Phytophthora fragariae* on strawberry [C.M.I. map No. 62], *Podosphaera* [? *oxyacanthae* var.] *tridactyla* [*R.A.M.*, 32, p. 342] on plum, *Xanthomonas pelargonii* on pelargonium [cf. 32, p. 678], and the viruses of tomato spotted wilt [C.M.I. map No. 8], tomato bushy stunt, and lettuce mosaic.

KOBEL (F.). **Jahresbericht 1952/1953 der Eidg. Versuchsanstalt für Obst-, Wein- und Gartenbau in Wädenswil.** [Annual report for 1952–3 of the Federal Experiment Station for Fruit-Growing, Viticulture, and Horticulture at Wädenswil.]—*Annu. agric. Suisse*, (55), N.S., 3, 7, pp. 585–670, 5 figs., 2 graphs, 1954.

Most of the items of phytopathological interest in this report [cf. *R.A.M.*, 32, p. 302] have already been noticed from other sources. Of 119 plant protectives submitted for testing during the period under review (p. 596), 68 (57 per cent.) were approved and 44 put on the market.

The best control of a strain of *Rhizoctonia* which caused heavy damage to vine grafts in forcing boxes was secured in H. FISCHER's experiments (pp. 617–618) by treatment of the sawdust packing with a combination of 0·3 per cent. copper sulphate and 0·25 per cent. orthocide [captan], the former being applied to the lower and the latter to the upper layers.

SALZMANN (R.). **Tätigkeitsbericht der Eidg. Landwirtschaftlichen Versuchsanstalt Zürich-Oerlikon überd as Jahr 1953.** [Report on the work of the Federal Agricultural Experiment Station Zürich-Oerlikon for the year 1953.]—*Annu. agric. Suisse*, (55), N.S., 3, 8, pp. 671–729, 2 figs., 1954.

In addition to information already noticed from other sources, this report for the period from 1st July, 1952, to 30th June, 1953 [cf. *R.A.M.*, 33, p. 207], contains the following items of phytopathological interest. Notwithstanding the very favourable conditions for the transmission of potato leaf roll and other viruses [see below, p. 241] prevailing in the Zürich district of Switzerland in 1953, preharvesting methods, i.e., roguing and haulm-killing with DNC preparations [32, p. 639], proved remarkably effective in 'seed' certification plots. Three formulae each of parathion and a phosphoric acid ester were tested for the control of aphid vectors (principally *Myzus persicae*); a 0·1 per cent. parathion spray, applied at weekly intervals, was approved for further use.

New foci of potato wart [*Synchytrium endobioticum*] were detected in the canton of Schwyz and near Zürich. In Val Colla, Prätigau, and Einsiedeln the replacement of susceptible by immune varieties is proceeding satisfactorily.

On wheat, among the fungi responsible for exceptionally severe foliar shrivelling and glume discoloration were *Calonectria graminicola* [*C. nivalis*: see next abstract], *Septoria nodorum* [32, p. 246], and *Leptosphaeria clavata* [31, p. 58]. Dwarf bunt [*Tilletia controversa*] is extending its range and the possibility of control by breeding for resistance is under investigation [see next abstract and below, p. 220].

Stations fédérales d'essais agricoles, Lausanne. Rapport d'activité 1953. [Report for 1953 on the work of the Federal Agricultural Experiment Stations, Lausanne.]—*Annu. agric. Suisse*, (68), N.S., 3, 9, pp. 775–913, 13 figs., 9 graphs, 1 map, 1954.

The first part of this report deals with the routine work of the Stations [cf. *R.A.M.*, 33, p. 206] and the second consists of original contributions by members of the staffs. The following are among the numerous items of phytopathological interest. As soon as the snow thawed, sclerotia of *Typhula* [*graminum*: 32, p. 301] were observed on young wheat plants, which were also severely attacked by *Fusarium nivale* [*Calonectria nivalis*: see preceding abstract]. Favourable weather conditions led to an increase in the loose smuts of wheat and barley [*Ustilago tritici* and *U. nuda*], and substantial damage was caused by *Tilletia brevifaciens* [*T. controversa*: loc. cit.], which attacked up to 70 per cent. of the wheat plants in certain localities of the cantons of Vaud and Fribourg.

The first outbreaks of potato early blight (*Alternaria solani*) were observed on 26th June at Céry, near Lausanne, and by 17th July the disease was prevalent on all susceptible varieties in the vicinity. Following a dry summer, the tubers were heavily infected by mid-September, a month earlier than usual. A critical period for the development of *Phytophthora infestans* [34, p. 102] occurred between 8th and 12th June, and the first outbreaks were recorded at Céry on the 16th and in the canton of Valais on the 24th. Between 10th and 17th July an epiphytotic of blight involved the whole of French Switzerland; early tuber infections destroyed up to a fifth of the crop.

The weather conditions prevailing in the summer aggravated the effects of the nematode-*Thielaviopsis* [*basicola*] complex on Burley tobacco [32, pp. 301, 516].

In consequence of the dry spring and delay in the commencement of spraying *Pseudopeziza tracheiphila* caused fairly heavy damage on vines [32, p. 8] in the various regions of Vaud and Valais where it is endemic.

The perithecia of apple and pear scab (*Venturia inaequalis* and *V. pirina*) produced on fallen leaves matured at the beginning of April, but not until mid-May was the rainfall sufficient for ascospore liberation and the establishment of primary infections. The first lesions appeared on 28th May round Lake Geneva, and on 6th and 26th June, respectively, on the plateau and at altitudes above 650 m. In Ticino the outbreaks began early in May and continued until mid-July, when they were interrupted by a hot, dry spell, to be resumed with the recurrence of rainy weather at the end of the summer.

Beet yellows virus appeared three to four weeks later than in 1952 and was generally fairly mild. At Céry, where it was first observed on 26th June, the incidence of infection at the end of the season ranged from 30 to 40 per cent., but elsewhere it seldom exceeded 1 per cent. except in late-sown stands, one of which, near Lausanne, became completely diseased during October.

Of 2,300 fruit trees examined in the French cantons and Ticino, 193 (6 per cent.) exhibited characteristic symptoms of viroses [see below, p. 230]; not a single orchard was absolutely free and in some cases over half the trees were infected. A new case of stony pit was observed on the Le Lectier pear variety at Lausanne, while several Golden Delicious apple trees with rubbery wood symptoms were eradicated from a nursery in Valais.

The serological examination of tomato plants from Valais revealed 90 to 98 per

cent. infection by tobacco mosaic virus, which was sometimes difficult to recognize by the external symptoms. Many of the plants were also carriers of potato viruses X and Y. Tobacco ring spot virus was much more widespread than in 1952, attacking all tobacco varieties, though Mont-Calme Brun appears to be somewhat resistant.

Lettuce mosaic virus was virulent in some localities, especially the Orbe plain and in the Vidy district near Lausanne, where some crops were quite unmarketable, the plants having stunted and misshapen leaves and no hearts.

In an experiment conducted at an altitude of 650 m., the average yield reduction in Bintje potatoes caused by potato virus X was 6 per cent. Between 1951 and 1953 tests for sensitivity to strains of the virus from Eersteling [Duke of York] were performed on 63 new potato accessions, while 36 were similarly tested with potato virus A. Ten varieties (including Fortuna and Capella) proved to be hypersensitive to X [cf. 33, p. 552] and nine to A [32, p. 612], among them Ebstorf 47/4 and 48/50, Augusta, Fortuna, and Libertas.

In connexion with attempts to develop strains of the Madame Moutot strawberry variety free from virus 1 [see below, p. 232] all plants examined, even in mountainous regions where *Pentatrichopus fragaefolii*, the principal vector of strawberry viroses, is entirely absent, were found to be infected. A certain number of plants of this variety and Surprise des Halles were freed from the virus by heat treatment [loc. cit.]. Healthy material of the following varieties from East Malling [cf. 28, p. 341] is also available: Auchincruive Climax, Royal Sovereign, Huxley, Perle de Prague, and Early Cambridge. The results of tests on potted *Fragaria vesca* plants exposed to infection for a month in fields of Madame Moutot clearly demonstrated a correlation between the density of the aphid population and the incidence of yellow edge virus.

Twenty-seventh and Twenty-eighth Annual Reports of the Department of Scientific and Industrial Research, New Zealand, 1953 and 1954.—107 pp., 1953; 68 pp., 1954.

In the section of the 1953 report [cf. *R.A.M.*, 33, p. 139] dealing with the work of the Crop Research Division (pp. 24–28) E. J. Godley states that the oat varieties formerly used as resistant parents in breeding lines resistant to crown rust [*Puccinia coronata*] are no longer resistant to the races present in New Zealand; further resistant parents have been secured.

Losses from [unspecified] potato diseases amount to 20 to 25 per cent. of the annual crop, to the value of £200,000 to £400,000. In the Auckland district blight [*Phytophthora infestans*: 33, p. 280] could eliminate all the present susceptible varieties, a loss of £40,000 to £50,000 per annum, but for the weekly sprays. The blight strain from Pukekohe which attacked previously immune varieties has been identified as equivalent to Black's strain B [33, p. 250]. Two further strains have been found, one possibly strain C, on a hybrid immune from strains A, B, D, E, and F, and another on a hybrid immune from A, B, C, and D. It appears that the normal A strain can produce new types which survive when plants immune from A are grown but otherwise fail to persist in competition with the more vigorous A strain. A survey of the virus-free stocks being increased by the Department of Agriculture has shown that all five varieties are still free from X, Y, and leaf roll viruses and will now undergo trial for one season before replacing existing diseased stocks. Field studies demonstrated that leaf roll [32, p. 335] spreads very slowly at Lincoln, increasing from 0·5 to only 1·9 per cent. over four seasons, and virus Y relatively rapidly.

In crosses between swede varieties resistant and susceptible to club root [*Plasmodiophora brassicae*: 23, p. 159] resistance was transmitted to the F_1. Wilhelmsburger Otofte is resistant to infestation by *Brevicoryne brassicae* and somewhat resistant to *Myzus persicae* [33, p. 130].

Of 40 flax varieties from various sources tested for resistance to races 1 to 12 of rust [*Melampsora lini*: 32, p. 557], 1288/12 from Russia and Turkish Ech 121 showed a high percentage of immune plants. Two new rust races have been isolated: race 13 attacks the hitherto immune selections Koto 5 and 25 and race 14 attacks Redwood and others. All the selections, however, have high field resistance and Koto 25 has yielded more than Koto or Koto 5 and ripens earlier. Koto 5, 25, and Rocket are to be multiplied.

Among the items reported by G. H. CUNNINGHAM from the Plant Diseases Division (pp. 75–81) bean rust [? *Uromyces appendiculatus* on *Phaseolus vulgaris*: 33, p. 53] is stated to be prevalent in the Auckland area, causing considerable yield reductions in some late crops. Of 44 varieties tested one was highly resistant and two were resistant. Several apple rootstocks show considerable resistance to collar rot [*Phytophthora cactorum*: 31, p. 20; cf. 33, p. 609]. Of 48 linseed and 48 flax varieties tested 11 and three, respectively, were resistant to the races of *Melampsora lini* present in New Zealand. Several linseed and flax varieties were tolerant of *Mycosphaerella linorum*. The resistance of Golden Viking linseed to pasmo [33, p. 296] has completely broken down. A limited survey in north and mid-Canterbury revealed that *M. linorum* occurred in epiphytotic form, causing severe yield reductions; browning [*Polyspora lini*: 33, p. 296] was prevalent on Koto, while *Melampsora lini* was severe only on late-sown crops.

On peas collar rot (*Ascochyta pisi* [32, p. 656] and *Mycosphaerella pinodes*) [32, p. 415] and downy mildew [*Peronospora viciae*: 30, p. 361] were the most widespread diseases in Canterbury; there were four new records of wilt [*Fusarium orthoceras* var. *pisi*: 34, p. 71]. Collar rot inoculations were made successfully by pre-soaking pea seed in spore suspensions of *A. pisi* or spraying field plants with suspensions of this and *M. pinodes*. Of 100 swede and turnip crops in South Otago and Southland 24 per cent. were infected with club root and 84 per cent. with dry rot [*Phoma lingam*: 33, p. 140]. Several out of 50 swede varieties tested showed some resistance to *P. lingam*. Turnips were generally more resistant than swedes.

Serious reductions in wheat yields were due to abnormal weather combined with various diseases, chiefly *Septoria* blotch [*S.* (?) *nodorum*: C.M.I. map No. 283] on the leaves, straw, and ears. At least six physiologic races of wheat powdery mildew [*Erysiphe graminis*: *R.A.M.*, 30, p. 316] occur in New Zealand and all are fairly widespread. To date steeping pea, linseed, and *Brassica* seed for 15 minutes in carbon tetrachloride at temperatures of up to 145° F. for control of seed-borne diseases has not impaired germination [33, p. 296]. A method of timber preservation, the 'momentary-dip diffusion treatment', by which green sawn timber is passed through a bath or spray of concentrated boric acid/borax solution and stacked for a specified period, is being tested on a semi-commercial scale.

R. THOMSON, in charge of tobacco research (pp. 86–88), states that there was an average of only 4·8 per cent. mosaic [virus: 33, p. 70 and next abstract] in most gardens. Severe black root rot [*Thielaviopsis basicola*: loc. cit.] was observed in three gardens in the Motueka area and in four at Dovedale. Autumn applications to the seed bed of chloropicrin and D-D or 2¼ oz. micronized or flowers of sulphur per sq. yd. and in the field 10 cwt. sulphur per acre broadcast or 2 cwt. applied to the rows before planting gave good control. Angular leaf spot [*Pseudomonas angulata*: 26, p. 233] was observed in six gardens and there were isolated instances of streak and ring spot [viruses]. *Phytophthora* canker [*P. parasitica*: 33, p. 70 and next abstract] was observed in five gardens where it had occurred the year before. Oxford 1 and 3, Kentucky 34, Dixie Bright 101 and 102, Florida 301, and R.G. were highly resistant and Vamorr 48 and 50, Amarello, Virginia Gold, and Harrison's Special highly susceptible. Chlorobromopropene at 4 ml. per sq. ft. again gave good control of *Verticillium* wilt [*V. albo-atrum*: 33, p. 591] in the seed bed.

In the section on microbiological work at Canterbury Agricultural College

(pp. 104–105) M. M. BURNS states that potato pink rot (*P. erythroseptica*) is newly recorded for New Zealand [C.M.I. map No. 83]. Of 100 wheat varieties and selections tested on an area heavily infested with *Cercosporella herpotrichoides* [*R.A.M.*, 29, p. 15], Illini Chief Selection (from the United States), Selection 9 (*T*[*riticum*] *persicum* from Cyprus), Hofed 3 (Australia), *T. vulgare erythrospermum* (Uzbek), and Menno (United States) possessed a high degree of tolerance. Standard New Zealand varieties generally scored a high disease rating.

In the 1954 report it is stated that under conditions of severe infection by *M. linorum* the resistant linseed variety Marine yielded well above Golden Viking; furthermore, it is susceptible only to the rare and weak race 12 of *Melampsora lini*. Practical control of plum mosaic [31, p. 336] in cherry-plum cuttings grown as stocks has been achieved simply by removing infected plants. Six years ago over 30 per cent. of the cuttings in a large nursery were infected but in 1954 only one plant in 9,000 showed symptoms. The tobacco variety Virginia Gold has proved its resistance to *Thielaviopsis basicola* by yielding well on areas so badly infected that they were not worth planting with other varieties.

Annual Reports, Cawthron Institute, Nelson, New Zealand, 1952–53 and 1953–54.—42 pp., 2 pl., [? 1953]; 42 pp., 3 pl., [? 1954].

In the first report [cf. *R.A.M.*, 33, p. 69] it is stated that large brown blotches on tobacco leaves at Marahau appear to be caused by copper deficiency [cf. 29, p. 60]. The cured leaf contained only 3 to 9 p.p.m. copper as against 27 to 40 p.p.m. in healthy leaves. The corresponding manganese contents were 250 and 40 to 80 p.p.m. The omission of boron from sand cultures of raspberries [32, p. 398] at Rakau and Motupiku resulted in marked leaf distortion and a reduction in the boron content from 20 to 4 p.p.m. Raspberries at Motupiku benefited from copper sprays. In spite of wet weather in November and December, which favoured leaching, further applications of magnesite and dolomite produced healthy foliage on plots of Cox's Orange and Sturmer apple trees at Tasman and Braeburn. Young replants benefited from magnesium top-dressings.

Neofabraea malicorticis [32, p. 83] was isolated from trunk cankers on Sturmer apple trees at Hope and from dying Bon Chrétien pear trees at Stoke.

In a test to determine the reaction of five outdoor tomato varieties to hard core [30, p. 393] the percentages of affected fruit at harvest were Kondine 62, Exhibition 54, Hall's 39, E.S.5 12, and Invincible 2. Exhibition gave the highest yield.

In spite of showery weather in November and December symptoms of boron deficiency were observed in a few hop gardens [33, p. 631]. Magnesium deficiency [cf. 29, p. 533] has been observed during the past two seasons on granite soils or those derived from the Moutere Gravel formation. *Verticillium albo-atrum* was isolated from hops [33, p. 591] in a recently established garden in the Tadmor Valley, previously planted with potatoes.

Tobacco mosaic [virus: see preceding abstract] was more prevalent (12·6 per cent.) in crops treated with standard fertilizer at 1,600 lb. per acre and following ryecorn, rye grass [*Lolium* spp.], and oats with vetches than in those receiving 1,000 lb. and following lupins (8·6).

In the second report it is stated that an entire Californian hop plant contains an average of 14 p.p.m. boron and the crop absorbs the equivalent of 1 lb. hydrated borax per acre [33, p. 631] of which the cones contain approximately one half. Incurled leaves from chlorotic plants were deficient in zinc, typical analyses for affected plants being 16 and 22 p.p.m. as against 22 and 39 p.p.m. for the healthy. Zinc salts applied at 4 and 8 oz. per hill raised the content to 55 and 73 p.p.m., respectively, with no deleterious effect on the plant. Symptoms of magnesium deficiency were observed in several hop gardens at the 1953 harvest, even where ground magnesite or dolomite had been applied in 1950. Neither compound

appeared to have raised the magnesium content of leaves or cones, and a further application of each at the rate of 1 lb. per hill in the spring of 1953 did little to correct the deficiency in 1954.

No new outbreaks of black root rot (*Phytophthora* [*cactorum*: 33, p. 140]) were found. As before the disease was worst at Riwaka and almost as bad at Motueka; in the Moutere valley, it was confined to low-lying gardens. Inoculation tests on the wounded crowns of seedlings, in collaboration with the Hop Research Station, resulted in symptom expression within 8 to 14 days. In pot experiments to compare the pathogenicity of the local strain of *V. albo-atrum* with that causing fluctuating wilt in England [33, p. 260], of six Fuggle plants inoculated with the English strain two died, two developed marked leaf symptoms and discoloration of the wood cylinder which yielded the pathogen, and two no symptoms at all. None of the six Californian plants inoculated with the same strain showed any leaf symptoms and only two had any wood discoloration; no pathogen could be isolated. Inoculated with the local strain, three of six Fuggle plants developed leaf symptoms; two with marked wood discoloration yielded *V. albo-atrum*. Four Californian plants developed leaf symptoms and five showed discoloration but only two yielded the pathogen. No signs of infection resulted from inoculating Californian plants with strains of *V. dahliae* from tobacco, tomato, and potato.

Apple leaves from unthrifty trees at Tasman contained only 2 to 3·1 p.p.m. copper [30, p. 22]. Bordeaux sprays effected some improvement but soil dressings with 5 lb. copper sulphate per tree appeared detrimental. Further application of zinc sprays to Gravenstein trees at Tasman [30, p. 21] has increased the zinc content of the leaves but not affected tree growth. The rate of growth of magnesium-deficient apple trees was increased by 50 per cent. following soil treatment with dolomite prior to planting. Leaf development was also improved and retention prolonged to late in the season.

The results of soil treatment of glasshouse tomato plots with chloropicrin (eighth consecutive season) and with chloropicrin and D-D (fourth) were outstanding: yields were higher than with steam treatment and fruit quality was quite as good. Good control of tobacco black root rot [*Thielaviopsis basicola*: see preceding abstract] was obtained with chloro bromo propene injected or watered on to infested soil. Seedlings grown in treated soil gave 80 per cent. clean plants. Dithane D–14 used at 1·3 ml. per sq. ft. gave 89 per cent. clean plants while the untreated plots had 76 per cent. badly infected and 24 per cent. moderately so. Soil treatment with 3 ml. chloropicrin per sq. ft. gave the best control of *Phytophthora* canker [*P. parasitica*: see preceding abstract] in inoculated plots, with only 8 per cent. heavy infection as against 100 per cent. in the untreated.

MATSUYAMA (A.). **Studies on the microbial growth. Part 4. The methods for determining the viable count of the bacteria.**—*J. agric. chem. Soc. Japan*, 27, 1, pp. 7–11, 3 graphs, 1953. [Japanese, with English summary. Received 1955.]

The methods for making counts of viable bacteria were compared at the Department of Agricultural Chemistry, Tokyo University, Japan, and it was shown that there is no significant difference between colony counts obtained by repeated use of the same pipette from the same bacterial suspension, but when the suspension is diluted by using the same pipette the counts increase proportionately with the times of repeated use. No significant differences could be detected between the plating and capillary tube methods as regards mean counts and variances.

STAPP (C.) & KNÖSEL (D.). **Zur Genetik sternbildender Bakterien.** [On the genetics of star-forming bacteria.]—*Zbl. Bakt.*, Abt. 2, 108, 8–12, pp. 243–259, 4 pl., 1 graph, 1954.

Further studies on the life-cycle of *Agrobacterium* [*Bacterium*] *tumefaciens*

(*Chrysanthemum frutescens* II b and dahlia Ra strains), using various nuclear stains and an electron microscope, fully confirmed previous findings [*R.A.M.*, 21, p. 444] that the individual nuclei fuse into a single central nucleus. The subsequent nuclear division is followed by subdivision into short rods. The development of *A. radiobacter* [10, p. 167], *Rhizobium pisi*, *R. trifolii*, and a marine bacterium, *A. stellulatum* n.sp., presented many analogies with that of *B. tumefaciens*.

HILDEBRANDT (A. C.), RIKER (A. J.), & WATERTOR (JEAN L.). **Growth and inhibition of tissue cultures on media with different concentrations of organic acids.** —*Phytopathology*, 44, 8, pp. 422–428, 14 graphs, 1954.

At the Department of Plant Pathology, University of Wisconsin, crown gall [*Bacterium tumefaciens*] tissues from marigold [? *Tagetes patula*], Paris daisy [*Chrysanthemum frutescens*], periwinkle [*Vinca rosea*], and sunflower [*R.A.M.*, 31, p. 105; 32, p. 475; 33, p. 661, *et passim*] and normal tobacco callus cultures made no appreciable growth on media with various organic acids or calcium gluconate at concentrations ranging from 0·015 to 4 per cent. as the sole source of carbon. However, with 2 per cent. sucrose many of the acids were tolerated over a wide range of concentrations, though increases in strength beyond a certain point (varying in the different species) resulted in partial or total inhibition. Acetic, formic, and propionic acids, even at the lowest concentrations used, arrested or completely prevented growth in all the species.

GARBER (E. D.). **The role of nutrition in the host-parasite relationship.**—*Proc. nat. Acad. Sci., Wash.*, 40, 12, pp. 1112–1118, 1954.

During further investigations at the Department of Botany, University of Chicago, seven biochemical mutants of *Erwinia aroideae* strain RK [*R.A.M.*, 33, p. 217], each requiring one or two amino acids, were tested for their virulence on cut surfaces of cucumber, potato, turnip, radish, and carrot. A positive growth reaction was obtained with virulent mutants when blocks of tissue from the attacked hosts were added as auxanographic supplements. This did not occur with avirulent mutants given tissue from resistant hosts, though tissue homogenates from these hosts did provide the required nutrilites when added as auxanographic supplements. The avirulence of specific biochemical mutants for certain host species was related to their inability to utilize the available concentration of the required nutrilite at the cut surface of the host. Nutrition and the host-parasite relationship are discussed.

HOLLIDAY (P.). **Control of witches' broom disease of Cacao in Trinidad.**—*Trop. Agriculture, Trin.*, 31, 4, pp. 312–317, 1954.

The author reviews the various recommendations and tests that have been made from time to time for the control of cacao witches' broom [*Marasmius perniciosus*: *R.A.M.*, 33, p. 662] by cutting out diseased material. The recommendations of Baker and Crowdy [22, p. 242], which are briefly summarized, still hold good in Trinidad. The figures for pod infection on I.C.S.1 from 1943 to 1953 show that in spite of the careful removal of brooms losses remained fairly constant, though much lower than those that might have occurred in the absence of control. Removal of surrounding heavily diseased material, completed in 1949, has not reduced pod infection. It is concluded that control by this method cannot be satisfactory in Trinidad except on heavily diseased fields and very susceptible varieties. As cacao cultivation becomes more intensive, control will increase in efficiency. Pod losses are considered to be due to infection from sources near by and can be controlled even if surrounding fields are heavily infected. Brooms, on the other hand, arise from more distant sources of infection.

Hoeser (K.). **Untersuchungen über die physiologische Spezialisierung des Weizenschwarzrostes.** [Studies on the physiologic specialization of Wheat black rust.] —*Phytopath. Z.*, 22, 3, pp. 301–304, 1954.

During 1952 and 1953 the author analysed the physiologic race composition of 76 samples of *Puccinia graminis*, mostly from Bavaria, with a few from Württemberg [*R.A.M.*, 18, p. 383] and Austria [32, p. 242]. The closely related races 21 and 90 predominated and the others represented were 2, 15, 17, 23, 34, 40, 44, 77, 89, 102, 111, 112, 116, 130, 144, 166, and 178; the formerly widespread 14 [34, p. 89] was entirely absent [18, pp. 730, 731]. According to a personal communication from s'Jakob (Wageningen) race 21 is also prevalent in Holland and France.

Salazar (J.). **Reconocimiento de las especies de roya del Trigo y estimación de la intensidad de su ataque.** [Recognition of the species of Wheat rust and evaluation of the intensity of its attack.]—*Bol. Inst. Invest. agron., Madr.*, 14, 30, pp. 248–261, 3 col. pl., 3 figs., 1954. [English and French summaries.]

A description is given of the macroscopic characters serving for the differential diagnosis of wheat rusts (*Puccinia graminis*, *P. glumarum*, and *P. triticina*) in Spain [*R.A.M.*, 34, p. 88]. Following a critical commentary on the principal scales already published for evaluating rust intensity, the author proposes a new one with only nine degrees for *P. glumarum* [cf. 29, p. 609] and a modification of the scale of Peterson *et al.* [28, p. 212] with the same number for *P. graminis* and *P. triticina*. In conclusion, attention is drawn to various factors complicating the appraisal of infection in experimental plots and simplified norms are suggested for the purpose.

Villanueva N[ovoa] (R.). **Progresos en el mejóramiento del Trigo para resistencia a las royas, especialmente para la raza 15 B de Puccinia graminis tritici.** [Progress in the improvement of Wheat for resistance to the rusts, especially for race 15B of *Puccinia graminis tritici*.]—*Inf. Cent. Invest. agric., Lima*, 80, 34 pp., 12 figs., 1953. [English summary. Mimeographed.]

Of the 1,137 Mexican wheat varieties and hybrids tested in the field in 1952 about 125 days after planting at the Agricultural Experiment Station 'La Molina', Lima, Peru, for reaction to races 14, 15B, and 17 of *Puccinia graminis* [*R.A.M.*, 33, p. 528], 226 were resistant, 42 moderately so, 87 segregating, and the rest susceptible. The varieties which proved to be resistant were Kentana 48, Kentana 51B, Kentana 52A, Kentana 52B, Kenya 9906 RF. 324, and Kenya–Gular RF. 3015. Resistance to *P. triticina*, assessed 102 days after planting, was shown by Barrigón Yaqui, Barrigón Zamora, Candeal, Frontana RF. 1387, and Supremo 211, and to *Erysiphe graminis* by Barrigón Yaqui, Barrigón Zamora, Frontana RF. 1387, Kentana 52B, Kenya 9906 RF. 324, Lee, N442, Supremo 211, and Supremo 51.

The 435 World Collection entries included 57 resistant to *P. graminis*, 39 moderately so, and eight segregating. Among those resistant to both *P. graminis* and *E. graminis* were Egypt Na 101, P.I. 139599, Kenya Governor, Kenya Standard, Kenya 117A, Khapli, *Triticum persicum fuliginosum* (from Italy), Timstein–Henry, II–44–52, a number of Kentana selections, four crosses between Kenya–Candeal and two Candeal–Kenya selections, an Egypt–Timstein and a Yaqui (Egypt–Kenya) line, two Sando 1951 selections, and Renacimiento–Kenya, 3708–22. Resistance to *P. triticina* was shown by two Kenya selections, Timstein–Henry, II–44–52, two lines of Kenya–Supremo, one each of Kentana, Mentana–Kenya, Yaqui (Egypt–Timstein), and Yaqui–Kentana, the two above-mentioned Sando 1951 selections, and Renacimiento–Kenya, 3708–22.

Only four of the 113 wheat varieties and hybrids submitted for testing from other Pan-American countries were resistant to *P. graminis*, namely, 1253 and 1788 from Paraguay, and Kentana 48 × Mentana Resistente II–505 and (Egypt 101–

Timstein) Frontana II–1541 from Colombia. One from Colombia, ((Kenya 324–Marroquí 2)×María Escobar)×Cinco II–1943, was resistant to *P. triticina*, while eight withstood infection by *E. graminis*, viz., Sud Africa BPI 59098 2208 and Og×Kenya×NE 4540 from Ecuador, 1253, 1807, and E.E.P.4 from Paraguay, and (Egypt 101–Timstein) Frontana II–1541, Kenya 58–Newthatch×Cinco II–1566, and Cientocincuenta×(Egypt NA 101–Timstein) II–1514 from Colombia.

Borlaug (N. E.). **Mexican Wheat production and its role in the epidemiology of stem rust in North America.**—*Phytopathology*, 44, 8, pp. 398–404, 2 graphs, 1954.

The wheat stem rust (*Puccinia graminis tritici*) situation in Mexico [*R.A.M.*, 28, p. 623] is described in this contribution presented on 9th September, 1953, at Madison, Wisconsin, at the Symposium on Cooperative Agricultural Research in the Western Hemisphere, arranged jointly by the American Phytopathological Society, the American Institute of Biological Sciences, and the Potato Association of America. During 1952 and 1953 the prevalence of physiologic race 15B [34, p. 28 and preceding abstract] rapidly declined in north- and south-central Mexico concurrently with an increase in the acreage of the resistant Kentana and Lerma varieties [31, p. 482], whereas on the Pacific coast, where the susceptible Yaqui is principally cultivated, it constitutes more than 60 per cent. of the isolates. At the same time, two closely related races, 49 and 139, which began to increase on late-planted Kenya 324 during 1950, have become widespread in central Mexico, where they were formerly unknown. They are pathogenic to Kentana and Lerma but not to Yaqui and Gabo.

No solution of the rust problem can be foreseen at present, since the constant changes in race composition [cf. following abstracts] necessitate a more flexible approach than that provided by conventional breeding methods. However, the possibility of such a development is under investigation (abs. in *Phytopathology*, 43, p. 464, 1953).

Stakman (E. C.). **Recent studies of Wheat stem rust in relation to breeding resistant varieties.**—*Phytopathology*, 44, 7, pp. 346–351, 1954.

Changes in the wheat stem rust (*Puccinia graminis*) situation in North America consequent on the immense increase in prevalence and distribution of race 15B in 1950 [*R.A.M.*, 30, p. 604 and preceding abstract] are discussed in this paper, presented at the Symposium on Genetics of Phytopathogenic Fungi in Relation to Basic Problems of Infectious Disease at Madison, Wisconsin, on 7th September, 1953, in connexion with breeding for resistance to the disease. Reference to most of the 13 papers listed in the bibliography has already been made in this *Review*.

Hanna (W. F.). **Progress in the control of Wheat stem rust in Canada.**—*Phytopathology*, 44, 8, pp. 404–405, 1954.

This paper, presented at the Symposium on Agricultural Research in the Western Hemisphere at Madison, Wisconsin, on 9th September, 1953, comprises observations on some important landmarks in the history of breeding wheat for resistance to stem rust [*Puccinia graminis*] in Canada, concluding with a brief discussion of the complexity of the international problem of control due to the continuous production on the barberry of new physiologic races [cf. *R.A.M.*, 34, p. 142 and preceding abstracts]. Mention of the various lines of research referred to has been made from time to time in this *Review*.

Athwal (D. S.) & Watson (I. A.). **Inheritance and the genetic relationship of resistance possessed by two Kenya Wheats to races of Puccinia graminis tritici.**—*Proc. Linn. Soc. N.S.W.*, 79, 1–2, pp. 1–14, 1954.

At the University of Sydney, New South Wales, the inheritance of resistance to *Puccinia graminis* [*R.A.M.*, 33, pp. 221, 715] was studied in the F_1, F_2, F_3, and F_4 generations of crosses of the highly resistant varieties Kenya 744 and Kenya 117A with the susceptible Federation 107 and Chinese White 1806. The mode of inheritance was investigated using race 222AB and later races 126, 126B, and 222BB, all from Australia, race 38 from the United States, and race 122 from Kenya. The reactions of both Kenya wheats to all the races were considerably influenced by temperature, the more resistant reaction being obtained at approximately 60° to 65° F. and the less resistant at about 75° to 80°. The tests with Federation, which showed only partial resistance to race 38 at the lower range, were carried out at the higher temperatures. It was found that Kenya 744 and Kenya 117A each possess one dominant gene (Sr. Kb 1, formerly H and I) for resistance to races 126, 126B, 222AB, and 222BB, and two dominant factors for race 38, one of which is the same as the foregoing; the other, in Kenya 117A (Sr. Kd 1), also conferred resistance to race 122, but Kenya 744 is susceptible to this race. Some evidence was obtained that independent genes confer rust resistance to the various races prevailing in different geographical areas. The gene present in Kenya 117A responsible for resistance to the Australian races is probably the same as that in Kenya 744. A satisfactory correlation was observed between seedling and mature plant reactions to Australian races in Federation crosses, but field resistance appeared to be influenced by modifying factors.

It is concluded that it might be better not to use both Kenya varieties concurrently for breeding programmes against stem rust in Australia, since they are rather alike genetically.

Johnston (C. O.) & Levine (M. N.). **Physiologic races of Puccinia rubigo-vera tritici in the United States in 1953.**—*Plant Dis. Reptr*, 38, 9, pp. 647–648, 1954. [Multilithed.]

Twenty-eight physiologic races of wheat leaf rust (*Puccinia rubigo-vera tritici*) [*P. triticina*: *R.A.M.*, 34, p. 141] were identified at Kansas and Minnesota Experiment Stations, in co-operation with the United States Department of Agriculture, among 248 collections received from 26 States in 1953 [cf. 33, p. 77]. Race 5 was the most prevalent (28·4 per cent. of the 844 isolates), occurring in all the States, followed by races 15 (17·3) and 105 (8·4). Races 35 (7·2) and 122 (7·6) both increased in prevalence, particularly in Kansas and Texas; they attack most of the differential varieties and some other varieties with known resistance to other races. Race 58 (5·6) was most abundant round the Great Lakes, along the southern Atlantic coast, and round the Gulf coast, 93 (1·7) in the south-east, and 11 (5·8) in the Pacific Coast States. Race 9 (0·6) continued to decline.

Van der Watt (J. J.) & Nortje (J. H.). **Diseases of Wheat.**—*Bull. Dep. Agric. S. Afr.* 334, pp. 64–72, 6 figs., 1953. [Received 1954.]

This bulletin, devoted to wheat production in South Africa, includes notes on the following diseases. Races 21, 34, 38, and 99 of stem rust (*Puccinia graminis*) [*R.A.M.*, 33, p. 657] were identified from 1920 to 1934; 96 per cent. of the samples belonged to race 34 [16, p. 368]. Hybridization of stem rust does not occur in South Africa owing to the absence of barberries (*Berberis* spp.). Races 11, 13, 15, 16, and 109 of *P. triticina* [26, p. 331] predominate. Loose smut (*Ustilago tritici*) is controlled by the hot-water treatment of bags of seed, using three drums. They are soaked for one minute at 49° C. in the first, drained and steeped for ten minutes at exactly 54° in the second, and finally steeped in cold water in the third, after which the seed is spread out to dry. Flag smut (*Urocystis tritici*) [C.M.I. map No. 80] is largely controlled by the use of resistant varieties, crop rotation, and seed treatment, which is also used against bunt (*Tilletia tritici*) [*T. caries*: No. 294]. Leaf

blotch (*Septoria tritici*) and glume blotch (*S. nodorum*) [No. 283] may cause severe losses. Eye spot (*Cercosporella herpotrichoides*) [20, p. 295] has spread alarmingly in the Malmesbury and Caledon areas during the past few years. Early sowing and measures to encourage strong straw should help to reduce losses. Root rot (*Ophiobolus graminis* and *Fusarium* spp.) [30, p. 515] has also increased markedly in the western Cape and all varieties and hybrids appear to be susceptible.

Noll (A.). **Auftreten und Verbreitung physiologischer Rassen des Weizengelbrostes (Puccinia glumarum) in der Bundesrepublik Deutschland in den Jahren 1946–52.** [Occurrence and distribution of physiologic races of Wheat yellow rust (*Puccinia glumarum*) in the Federal Republic of Germany in the years 1946–52.] —*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), *Stuttgart*, 7, 1, pp. 10–13, 1 map, 1955.

During the period from 1946 to 1952, a total of 246 samples of wheat yellow rust (*Puccinia glumarum*) from different parts of the Federal Republic of Germany (but excluding the eastern zone, which was represented in earlier surveys) yielded 11 physiologic races, among which race 7 predominated [*R.A.M.*, 33, p. 588]. Next in frequency came race 5, which was found principally in eastern Lower Saxony and the south, while the remaining nine, viz., 2, 55, 9, 54, 1, 8, 16, 49, and 9, were all more or less sporadic. Thus, the already widely distributed race 7 has again extended its range at the expense of races 5, 8, and one or two others.

Pichler (F.). **Über den Zwergsteinbrand.** [Concerning dwarf bunt.]—*Pflanzenarzt*, 7, 9, p. 3, 1954.

Fields affected by wheat dwarf bunt [*Tilletia controversa*] in Austria [*R.A.M.*, 33, 223] should be treated, within two weeks after sowing, with brassicol superconcentrate [see next abstract] at the rate of at least 50 kg. per ha., applied with non-nitrogenous fertilizers; the fungicide must not be harrowed into the ground. Heavy applications of nitrogen, especially manure, and early sowing seem to favour the fungus.

Aebi (H.). **La lutte contre la carie naine du froment (Tilletia brevifaciens, G. W. Fischer).** [The control of dwarf bunt of wheat (*Tilletia brevifaciens* G. W. Fischer).]—*Rev. rom. Agric.*, 10, 10, pp. 77–79, 1 fig., 1954.

Dwarf bunt of wheat (*Tilletia brevifaciens*) [*T. controversa*] in Switzerland [cf. *R.A.M.*, 33, p. 206] has hitherto been confined mainly to altitudes above 620 m. In field tests [? in 1954] near Maracon (Vaud) and Cernier (Neuchâtel), seed disinfection alone effected no reduction in infection. Soil disinfection in conjunction with seed treatment on plots at Maracon with brassicol super [33, p. 531 and preceding abstract] (75 kg. per ha.) soon after sowing reduced the number of infected ears (per 5 sq. m.) on Mont-Calme 268 from 187 (untreated) to 8, the number for HCB (anticarie) being 10. At Cernier the corresponding figures were 27, 2, and 0·3. Under field conditions brassicol super gave complete control at Maracon and 0·7 infected ears per are at Cernier, the same variety and Probus being used; cyanamide was ineffective, sometimes resulting in increased infection [cf. loc. cit.].

Of 33 wheat varieties tested, only ten (all American) showed some resistance, particularly Wasatch (no infection), Hymar, Cache, and Rex. Studies on hybrids between these and other reputedly resistant varieties, and with Swiss varieties, are in progress.

To protect bunt-free areas it is recommended that only seed and straw from authorized sources be used; seed from suspected areas should be disinfected with HCB or PCNB products; in contaminated zones the cultivation of spring wheat is recommended, as it is protected from infection by seasonal climatic conditions;

thrashing and sorting machines, after having been used for bunted lots, should be carefully cleaned and disinfected with formalin (2 l. 40 per cent. commercial per 100 l. water). For soil disinfection brassicol super powder is recommended at 75 kg. per ha., mixed with fertilizer or sand and applied soon after sowing. It should cover the whole area evenly, particularly the field edges, and be left on the soil surface, the treatment being repeated for each fresh sowing.

Gassner (G.) & Niemann (E.). **Symptome der Steinbranderkrankung (Tilletia) bei Weizen und Roggen.** [Symptoms of bunt disease (*Tilletia*) in Wheat and Rye.] —*Phytopath. Z.*, 22, 3, pp. 288–300, 7 figs., 5 graphs, 1954.

In further studies on *Tilletia* spp. at the Technical Institute, Brunswick [*R.A.M.*, 34, p. 30], the inoculation of Carsten V winter wheat with *T. caries* resulted in a shortening of the haulms by about 10 per cent. compared with 42 to 58 per cent. for General v. Stocken winter and v. Rümkers Sommerdickkopf wheat artificially infected by *T. brevifaciens* [*T. controversa*] and 53 per cent. for Petkus winter rye inoculated with a collection of *T. secalis* from Austria [30, p. 408]. All three species caused typical malformations of the ears. Thus, in both winter and summer wheats attacked by *T. caries* the ears were abnormally narrow and the axes elongated, thereby widening the spaces between the individual spikelets. The ears infected by *T. controversa* were very squarrose and irregularly shaped; both species reduced the number of spikelets. Ears of rye with *T. secalis* were generally smaller and narrower than those of healthy plants, but these anomalies cannot be definitely referred to the pathogen. A remarkable feature of the diseased ears was the transformation into a bunt ball of the ovaries of the third, and sometimes of the fourth flower; they ruptured readily, showering spores over the field. The bunt balls of all three species were well developed at flowering time and the stamens severely deformed, especially in rye.

Müller (H.) & Schuhmann (G.). **Untersuchungen über die Ursachen von Beizfehlschlägen bei der Bekämpfung des Weizensteinbrandes (Tilletia tritici (Bjerk.) Winter).** [Studies on the causes of disinfection failures in the control of Wheat bunt (*Tilletia tritici* (Bjerk.) Winter).]—*Phytopath. Z.*, 22, 3, pp. 305–326, 3 graphs, 1954.

Laboratory and field experiments at the Biological Institute, Berlin-Dahlem, failed to demonstrate a consistent correlation between the rate of germination of various spore collections of *Tilletia tritici* [*T. caries*] from widely separated parts of Germany and the incidence of infection in field plots of wheat grown from mercury-treated seed [cf. *R.A.M.*, 18, p. 303]. Individual collections varied in their response to the [unnamed] mercurials used in the tests, the differences being reflected in a range of 0 to 5·2 per cent. bunt in the field. Such discrepancies, however, do not adequately explain the failures in fungicidal treatment frequently observed of recent years and occasionally earlier, which must obviously be attributable to the coincidence of several adverse environmental factors, including a soil temperature of about 5° C. [cf. 19, p. 80], a high soil moisture content [cf. 11, p. 707], soil type [6, p. 473; 19, p. 524], specific varietal reaction [4, p. 339; 13, p. 85; 17, p. 228], and the possible development of mercury-resistant biotypes of the pathogen [15, p. 144]. Pending further investigations to determine the importance of these influences, heavy losses of winter wheat may be avoided by reasonably early sowing, proper preparation of the seed-bed to ensure rapid emergence [cf. 19, p. 80], and an eventual change of fungicide to prevent the development of resistant physiologic races.

Nisikado (Y.) & Inouye (T.). **On the sexuality of the Wheat scab fungus, Gibberella zeae (Sch.) Petch. On the germination physiology of conidiospores of**

the Wheat scab fungus Gibberella zeae (Sch.) Petch.—*Ber. Ōhara Inst.*, 10, 2, pp. 53–65, 1954.

A tabulated account is given of experiments in the production of perithecia from 124 mono-ascospore isolates of *Gibberella zeae* obtained from wheat and rice straw at the Ōhara Institute, Okayama University, Kuraschiki, Japan [cf. *R.A.M.*, 31, p. 548]. On steamed rice straw in beakers near a window partly exposed to sunshine both mixed cultures and individual isolates gave rise to perithecia and mature ascospores, thereby confirming Eide's conclusion as to the homothallism of the fungus [16, p. 645]. In experiments to determine the factors controlling conidial germination in *G. zeae*, a density of 50 to 70 conidia per microscope field at a magnification of × 160 was found to be optimum. Germination in re-distilled water was very poor, but could be improved by additions of glucose, laevulose, magnesium sulphate, or potato decoction. The optimum temperature for the production and maturation of the conidia was between 24° and 27° C. Viability declined with time. No significant loss of viability, however, resulted when the conidia were washed in re-distilled water and centrifuged. A gelatinous substance covering the conidia appeared to stimulate germination.

Conners (I. L.). **Virus diseases of cereals in Canada.**—*F.A.O. Pl. Prot. Bull.*, 1, 5, pp. 72–73, 1953.

Wheat streak mosaic virus [*R.A.M.*, 34, p. 89] was found for the first time in southern Alberta in 1952. Severe damage occurred in several fields of winter wheat in the Cardston and Pincher Creek districts. Many fields of spring wheat were also affected, particularly those near infected winter wheat. In the autumn of 1952 streak mosaic occurred in many fields of winter wheat sown in August and early September; volunteer wheat plants growing in summer fallow or stubble became infected in late summer or early autumn and acted as sources of the virus.

Observations in Manitoba indicate that while false stripe virus may be endemic in experimental plots of barley [33, p. 665], it is comparatively rare on farms.

Late reports on newer varieties.—*Seed World*, 75, 7, p. 9, 1954.

Sauk, a new oat variety developed by the University of Wisconsin, is reported to possess resistance to race 7 of stem rust [*Puccinia graminis*: *R.A.M.*, 33, p. 718], though susceptible to race 8, and medium resistance to leaf [crown] rust [*P. coronata*: see next abstract].

The Idaho [Agricultural Experiment] Station hopes to increase the new wheat variety Lemhi 53, resistant to stem rust [*P. graminis*: 33, p. 660], for release to certified seed growers in 1955.

Simons (M. D.). **Physiologic races of crown rust of Oats identified in 1953.**—*Plant Dis. Reptr.* 38, 9, pp. 649–652, 1954. [Multilithed.]

In investigations by the United States Department of Agriculture and Iowa Agricultural Experiment Station, Ames, using a new set of 10 differential oat varieties, 18 physiologic races of crown rust (*Puccinia coronata*) [*R.A.M.*, 34, p. 90] were identified among collections obtained in 1953 from the United States and Canada. Of these, race 202 was predominant (45 per cent. of 530 isolates) followed by races 203 (15) and 213 (14). Race 241 (6) was more prevalent than in previous years. Ninety-one per cent. of the races attacked Bond, representing a decline in number, and 25 per cent. Victoria.

Of the 106 isolates from *Rhamnus* spp. (mostly *R. cathartica*) race 202 comprised 49·1 per cent. followed by 203 (23·6), 241 (11·3), and 105 (5·7).

Konzak (C. F.). **Stem rust resistance in Oats induced by nuclear radiation.**—*Agron. J.*, 46, 12, pp. 538–540, 3 figs., 1954.

The F_1 plants from seed of Mohawk CI 4327 oats exposed to thermal neutrons in the thermal column of the Brookhaven reactor were grown at Aberdeen, Idaho, in 1952, and the remainder of the study reported here was conducted at Brookhaven National Laboratory, Upton, New York, in 1953. *Puccinia graminis avenae* race 7a [cf. *R.A.M.*, 30, p. 604] was artificially introduced into the field and severely attacked all but 74 plants in 49 progenies, which had presumably acquired resistance to the pathogen through mutations induced by irradiation of the seed. One rust-resistant plant was found in a plot of untreated seed.

The results of small-scale greenhouse tests on the progeny of the resistant plants showed that the same reaction was already present in the seedling stage, being apparently inherited as a simple dominant factor. Resistance was of a similar type (1) to that of Richland CI 787.

A number of other mutations, not yet investigated, in leaf and seed colour and plant habit were also observed, and it would appear that radiation may profitably be used in plant-breeding programmes to modify disease reaction and other characters towards greater agronomic utility.

Arny (D. C.) & Leben (C.). **Vapor action of certain mercury seed treatment materials.**—*Phytopathology*, 44, 7, pp. 380–383, 1 graph, 1954.

At the Department of Plant Pathology, University of Wisconsin, the average incidence of seedling blight (*Helminthosporium victoriae*) [*R.A.M.*, 33, p. 476] on Vicland oats in two greenhouse tests was reduced from 20 to 0 and 1 per cent., respectively, by 32 and 16 days' exposure of the seed prior to sowing to the vapour [cf. 22, p. 477; 31, p. 428] of panogen (0·75 fluid oz. per bush.) [32, p. 548], the corresponding figures for ceresan M [loc. cit.] being 1 and 1 per cent. Panogen acted more rapidly than ceresan M, the percentages of infection being 2 and 3 per cent., respectively, after one and two days' exposure of the seed, compared with 16 and 9 per cent. for ceresan M. The average yields for 1952 and 1953 in field plots sown with naturally infected seed treated with ceresan M and panogen were 62·4 and 60·1 bush. per acre, respectively, compared with 50·8 for untreated seed. The results obtained in comparable tests with agrox and setrete [loc. cit.] were less satisfactory.

Van Hoof (H. A.). **Enkele gegevens omtrent Sclerospora in Indonesië.** [Some data concerning *Sclerospora* in Indonesia.]—*Tijdschr. PlZiekt.*, 60, 5, pp. 221–227, 1 fig., 2 graphs, 1954. [English summary.]

The most important disease of maize in Indonesia is downy mildew (*Sclerospora maydis*) [*R.A.M.*, 32, p. 264]. The nomenclature of the fungus is briefly outlined. Its incubation period in maize was found to range from 12 to 39 days, with an optimum at 18 to 24.

Since 1947 a fungus referred to *S. philippinensis* [cf. 32, p. 427], a new record for Indonesia, has been responsible for considerable damage to maize in North Celebes. The morphological differences between this species and *S. sacchari* [33, pp. 51, 688], which is still unknown in Indonesia [C.M.I. map No. 21], are very slight and it appears necessary to determine whether it is able to attack sugar-cane.

S. northi [*R.A.M.*, 9, p. 249] has been detected on *Erianthus* sp. on the island of Sumba; it is the only species of *Sclerospora* in Indonesia known to form oogonia.

Silber (A[nni]) & Bischoff (W.). **Die Konstanz des Alkaloidgehaltes bei verschiedenen Rassen von Mutterkorn.** [The constancy of the alkaloid content in various races of ergot.]—*Pharmazie*, 9, 1, pp. 46–61, 7 graphs, 1954.

At the Institute for Cultivated Plant Research, Gatersleben, Germany, the

alkaloid content of individual sclerotia of a single local strain of rye ergot (*Claviceps purpurea*) [*R.A.M.*, 32, p. 181 and following abstracts and below, p. 237] was found to vary appreciably, large ones tending to be more productive than the smaller-sized. This observation contradicts Bredemann's conclusion (*Mykol. Zbl.*, 1, pp. 359–364, 1912) that smaller sclerotia, in consequence of their relatively larger surface, are richer in alkaloids than large ones. On the other hand, his finding that the alkaloid content increases in the outer sclerotial layers was confirmed. An examination of various stages of the fungus revealed alkaloids even in the loose, hyaline mycelium of the *Sphacelia* phase, but the maximum content was only reached with full sclerotial maturity. Attempts to increase the alkaloid content of the sclerotia by soil amendments with nitrogenous fertilizers were successful only when uneconomically large quantities of calcium ammonium nitrate were applied periodically.

In tests to determine the influence of climatic conditions on the alkaloid content of various races of *C. purpurea*, a local strain and several Portuguese yielded the same amounts in Finland, practically at the limit of rye cultivation just south of the Arctic Circle, as at Gatersleben. The alkaloid content of ergot samples collected on wild rye in Germany, Hungary, and Portugal was found to vary. In artificial culture the sclerotia of a given race contained the same alkaloid content as natural ones, which would appear, therefore, to be primarily a genetically conditioned character.

Mothes (K.) & Silber (Anni). **Über die Variabilität des Mutterkorns.** [On the variability of ergot.]—*Forsch. Fortschr. dtsch. Wiss.*, 28, 4, pp. 101–104, 1 graph, 1954.

In addition to information already presented on the culture of rye ergot (*Claviceps purpurea*) in Germany [see preceding abstract], the writers briefly describe two forms of variability in the alkaloid content of the sclerotia. One is connected with the development of the fungus on wild grasses, on most of which the alkaloid content is very low or non-existent, though it may equal or even exceed that of sclerotia produced on rye. Strictly speaking, therefore, the strain 'Gatersleben IV' cannot be simply defined as having an alkaloid content of 0·34 per cent. with 0·06 per cent. water-soluble fractions, but the words 'in culture on Petkus winter rye in the climate of central Germany' should be added.

The other form of variability arises from the occurrence of mixed infections, in which some of the sclerotia are not wholly black or white but particoloured. There is a total absence of alkaloids in the white sectors, while the black frequently contain large amounts. Hence it is concluded that such sclerotia arise from the mixture of two strains of the fungus. It is obvious that the widespread spontaneous production of sectorial sclerotia, coupled with the far-reaching changes in the local wild grass flora observed during the past three years, introduces a complicating factor into ergot production. Ideal for this purpose are sterile rye varieties, such as the tetraploid [see next abstract] or rye-wheat hybrids.

Deufel (J.). **Mutterkornzüchtung auf tetraploidem Roggen.** [Ergot culture on tetraploid Rye.]—*Arch. Pharm., Berl.*, 287, 6, pp. 329–332, 1 graph, 1954.

In comparative experiments at the Technical Institute, Karlsruhe, Germany, on ergot [*Claviceps purpurea*] production tetraploid Petkus rye proved to be much more advantageous than the diploid [see preceding abstracts]. It produced larger sclerotia and they contracted infection more readily. The average numbers of sclerotia per sq. m. obtained from the tetraploid and diploid plots were 143·5 and 105·8, their weights 28·9 and 8·2 gm., and their alkaloid contents 0·28 and 0·25 per cent., respectively.

Milovidov (P.). **Příspěvek k mikroskopicko-morfologickému studiu vývoje námele (Claviceps purpurea (Fries) Tul.).** [A contribution to the microscopic-morphological study of the development of ergot (*Claviceps purpurea* (Fries) Tul.).] —*Preslia*, 26, 4, pp. 415–426, 4 pl. (following p. 448), 1954. [Russian and German summaries.]

Following artificial conidial inoculations of rye with the ergot fungus (*Claviceps purpurea*) [C.M.I. map No. 10] in Prague, Czechoslovakia, hyphae could be traced not only in the pistil, but also in the stamens and sometimes other parts of the flower. The findings suggest that the change of sphacelial cells into sclerotial tissue, which usually occurs at the base of the ovary, may take place in other parts also. This view is supported by the presence of sclerotial groups in the sphacelial mycelium, the indistinguishable merging of sphacelial and sclerotial elements, the occasional appearance of the conidia-forming hymenial layer at the periphery of the young sclerotium, the fact that mature sclerotia contain, as a rule, sphacelial elements, and the occurrence of structures resembling sclerotia consisting almost entirely of sphacelial elements.

Kilpatrick (D. J.) & Lohmeyer (V. K.). **Copper deficiency of Citrus in South Australia.**—*J. Dep. Agric. S. Aust.*, 58, 3, pp. 129–130, 4 figs., 1954.

A case of copper deficiency in six-year-old Improved Valencia orange trees was reported from Murray Bridge, South Australia [cf. *R.A.M.*, 24, pp. 16, 189], for the first time in 1952. The fact that the plot had previously been planted intensively with vegetables, carrots in particular, may explain this exhaustion of copper. A rapid recovery followed spraying with 3–3–50 Bordeaux mixture and treating the soil under each tree with 4 oz. copper sulphate, but the original leaves developed zinc deficiency symptoms [33, p. 688], necessitating a zinc spray application, which resulted in complete recovery.

Plá (J. L.). **Informe sobre deshoja parcial del Café.** [Report on partial defoliation of Coffee.]—*Suelo tico*, 6, 28, pp. 209–213, 1952. [Received January, 1955.]

Tests in Costa Rica of the effect of artificial partial defoliation of coffee bushes on the severity of cock's eye (*Omphalia flavida*) [*Mycena citricolor*: see following abstracts] demonstrated that leaf removal from 11th to 16th June and 6th to 11th August resulted in complete absence of disease both in these plants and their progeny [cf. *R.A.M.*, 33, p. 351].

Coen (E.). **Ciclos climáticos en 80 años de observaciones de las lluvias en San José y sus relaciones con el ojo de gallo (Omphalia flavida).** [Climatic cycles in 80 years' rainfall observations in San José and their relation to cock's eye (*Omphalia flavida*).]—*Suelo tico*, 6, 28, pp. 248–256, 1 graph, 1952. [Received January, 1955.]

From a study of weather charts and rainfall graphs for San José, Costa Rica, it appears that at present climatic conditions are favourable to the development of cock's eye (*Omphalia flavida*) [*Mycena citricolor*: see preceding and next abstracts] on coffee but that the cycle may change in 1954.

Pérez S. (V. M.). **Control del 'ojo de gallo' por medio de fungicidas.** [Control of 'cock's eye' by means of fungicides.]—*Suelo tico*, 6, 28, pp. 264–271, 3 figs., 1952. [Received January, 1955.]

In the absence of previous information on this subject the author has tentatively prepared in tabular form a spray schedule for the control of cock's eye [*Mycena citricolor*: see preceding abstracts] on coffee in Costa Rica, tested from 1952 to 1953. It includes dithane and perenox, alone, alternating, and in combination, all plus

the sticker triton, in cycles of 15 days and a month. The results have already been noticed from a subsequent issue [*R.A.M.*, 34, p. 34].

Montero M. (J. M.). **La deficiencia del zinc en los almacigales de Café.** [Zinc deficiency in Coffee nurseries.]—*Suelo tico*, 6, 28, pp. 298–300, 1952. [Received January, 1954.]

Zinc deficiency is responsible for severe losses in Costa Rican coffee nurseries. Experiments in a nursery at San Juan de Dios de Desamparados demonstrated that marked improvement with no plant damage was conferred by spraying the seedlings six times at eight- to ten-day intervals from the age of four months with a solution containing 3 lb. zinc sulphate, 1½ lb. slaked lime, and 4 oz. triton sticker to 100 gals. water. Two labourers with one knapsack sprayer, working from 6 a.m. to 1 p.m., can treat 60,000 bushes 8 to 10 in. high: with two sprayers 100,000 can be treated. Each 5-gal. sprayer treats 3,000 to 4,000 plants. When the plants are 12 to 16 in. high the same sprayer contains sufficient mix for only 1,500 to 2,000.

Following the preparation of this paper a product termed Nu-Z (neutral zinc) came on the market and was tested at 6 lb. to 100 gals. Besides having the advantage of needing no lime, the spray increased the average percentage height of seedlings to 77·48 cm. from 62·38 cm., the leaves were more numerous and healthy, and the stems stronger.

Neal (D. C.). **The reniform nematode and its relationship to the incidence of Fusarium wilt of Cotton at Baton Rouge, Louisiana.** *Phytopathology*, 44, 8, pp. 447–450, 1 fig., 1954.

In the Baton Rouge area of Louisiana the development of a high incidence of wilt (*Fusarium oxysporum* f. *vasinfectum*) [*F. vasinfectum*] in the highly susceptible Half and Half cotton variety is dependent on heavy soil infestation by the nematode *Rotylenchulus reniformis* [cf. *R.A.M.*, 21, p. 197]. A greenhouse technique evolved for the assay of varietal reaction to the disease complex within six to seven weeks requires cultivation of the seedlings in soil inoculated with the fungus and having a nematode population comparable to that occurring in regions of severe wilt damage.

Under local conditions the nematode was apparently unable to break down the wilt resistance of certain varieties and strains, e.g., Auburn 56 and Plains from Alabama; Delfos 425–920, Delfos 9169, Deltapine 6, Deltapine 6×Delfos 6102, Cook 307-6×Delfos 9169, Louisiana Hybrid 33×14–312, Louisiana 33, Roxie, and Stoneville 2 B from Louisiana; and Coker 100 Wilt and derivatives from South Carolina. However, according to reports from Alabama, Delfos 425–920 and Louisiana Hybrid 33×14-312 are susceptible in that State to the wilt-nematode complex, while most of the 22 strains resistant at Baton Rouge succumbed to joint infection in Yahola very fine sandy loam at Natchitoches, Louisiana.

Kalyanasundaram (R.). **Soil conditions and root diseases. XIII. Symptomatology of Fusarium wilt.**—*J. Indian bot. Soc.*, 33, 4, pp. 329–337, 1 pl., 6 figs., 1954.

Starch tests as a diagnostic method for early wilt symptoms in cotton caused by *Fusarium vasinfectum* were applied for the first time in experiments under glass carried out at the University Botany Laboratory, Madras [cf. *R.A.M.*, 33, p. 691], to obtain a complete symptom picture of wilt.

A culture of *F. vasinfectum* from Baarn, grown in an oat-soil medium for 21 days, was mixed with weighed quantities of sterilized garden soil in pots. After 48 hours incubation seeds of the susceptible cotton (*Gossypium arboreum*) strains Karunganni (K. 2) and Malvi (M. 9) were sown. Maximum temperatures varied from 28° to 34° C. during the year.

The earliest visual symptom was vein-clearing in the leaves, the most common type of which was a gradually increased yellowing of the tissues round all the major veins and veinlets simultaneously, followed by necrosis of the interveinal tissue, resulting in the death of the leaves. A second type of yellowing differed in that it did not spread to more than a few adjoining veinlets, the leaves withered before interveinal necrosis started, and the marginal veinlets were affected. The third type consisted of partial vein-clearing involving only one half of the leaf, and not before it had reached an advanced state of necrosis did the other (lateral) half develop any symptoms. The progression of vein-clearing in three-month-old plants is described in detail.

The anatomy of leaves with vein-clearing indicated that the chlorenchyma adjacent to the vascular bundles was affected, especially the plastids. The chlorophyll content of the diseased plants was lower than that of healthy ones.

Starch tests on leaves from infected plants showed inhibition of starch synthesis along the region of vein-clearing. There was, however, starch translocation in the earlier stages of infection. The starch test (after a light period) also indicated the movement of toxins well in advance of visible symptoms.

Bird (L. S.). **Genetic-controlled carbohydrate and soluble nitrogen combinations in plant tissues causing resistance to the bacterial blight disease of Cotton.**—*Plant Dis. Reptr*, 38, 9, pp. 653–660, 1 fig., 2 graphs, 1954. [Multilithed.]

In investigations at College Station, Texas, to determine the nature of resistance in cotton to bacterial blight (*Xanthomonas malvacearum*) [*R.A.M.*, 32, p. 623; 34, p. 149], using resistant and susceptible strains of Stoneville 2B and Deltapine, carbohydrate determinations on eight leaf samples during a 24-hour period disclosed that the resistant material had 0·72 to 1·1 per cent. more total carbohydrate than the susceptible, the difference being due primarily to the starch fraction. Analyses of samples from individual plants of an F_2 population which was segregating for resistance indicated that resistance depended on the ratio of carbohydrate to soluble nitrogen.

Growth of *X. malvacearum* on agar media was inhibited by an unfavourable balance between dextrose and nitrogen, the general relationship being negative. Thus, higher levels of nitrogen were required to inhibit growth at low than at higher carbohydrate levels. An increase in either factor with the other remaining constant, or in both at the same time, inhibited growth.

When excised leaves from resistant and susceptible plants, previously inoculated with *X. malvacearum*, were placed three days later in solutions with favourable and unfavourable carbohydrate : nitrogen combinations, both types gave susceptible reactions in the former and resistant in the latter, suggesting that resistance is due to a genetically controlled physiological mechanism, producing a carbohydrate : nitrogen balance in the leaves unfavourable to the bacterium.

In greenhouse experiments plants with weak resistance became highly resistant after treatment with ammonium nitrate.

Coury (T.), Ranzani (T.), Malavolta (E.), & Sobrinho (M. O. C. Do B.). **Estudos sôbre o 'vermelhão' do Algodeiro (III).** [Studies on the 'reddening' of Cotton (III).] — *Ann. Esc. Agric. Queiroz*, 10 (*1953*), pp. 83–94, 1953. [English summary. Received February, 1955.]

In this paper the results are presented of experiments carried out at Piracicaba, São Paulo, Brazil, to determine the effect of various fertilizers on the development of a vermilion coloration of cotton leaves, associated with yield reductions which were particularly severe in the I.A.817 variety. The disorder, which was observed in plantations at the time of boll opening in 1948, 1949, and 1951, was most prevalent in the plots receiving no magnesium and was effectively combated by the application

to the soil of either magnesium sulphate or dolomitic limestone, using the latter at a rate 2½ times higher than the former. The defect is attributed, on the basis of the available data, to magnesium deficiency [cf. *R.A.M.*, 32, p. 624].

The omission of potassium from the fertilizer led to the development of typical potassium deficiency symptoms [23, p. 225].

Venning (F. D.) & Crandall (B. S.). **A parasitism mechanism of the Kenaf anthracnose organism related to the hydrogen ion concentration in the tissues of the host.**—*Phytopathology*, 44, 8, pp. 465–468, 1954.

The hydrogen-ion concentration of the tissues in normal *Hibiscus cannabinus* plants ranges from pH 4 to 6, but infection by *Colletotrichum hibisci*, the most serious pathogen of the crop in Cuba and Florida [*R.A.M.*, 34, p. 94], is accompanied by secretions from the hyphae of one or more strongly alkaline substances (pH 8·5) which readily diffuse into the surrounding tissues and through the cell membranes. The changed reaction of the host tissues is followed by disorganization of the enzyme systems, the development of a moribund or necrotic condition, and penetration by the fungus. On maize meal agar plates acidified with hydrochloric acid *C. hibisci* raised the pH from 3 to 8, this effect being detectable at 3 cm. or more from the colony. The availability of calcium and magnesium ions in the laboratory tap water at Santiago de las Vegas was found to enhance the capacity of the fungus to modify or alter the pH.

Kugler (W. F.), Godoy (E.), Marciotte (C.), & Bruni (O.). **Fuentes de resistencia a Melampsora lini (Pers.) Lév.** [Sources of resistance to *Melampsora lini* (Pers.) Lév.]—Abs. in *Arch. fitotéc. Urug.*, 5, 3, pp. 411–412, 1954.

Most of the information in this progress report on the development of resistance to flax rust (*Melampsora lini*) in Argentina [*R.A.M.*, 33, p. 221] has already been noticed from another source [30, pp. 320–321]. Extensive use has been made at the Pergamino Experiment Station of a line of fibre flax, 10678–3, descended from Bombay, which apparently carries one factor for moderate resistance to physiologic race 41 and another for high resistance to 22. The reactions of the progeny of this selection to race 42 vary from immune to highly resistant.

Frink (P. R.). **The status of Leptosphaeria heterospora on Iris rhizomes.**—*Plant Dis. Reptr*, 38, 9, pp. 674–675, 1954. [Multilithed.]

At the Plant Quarantine Branch, San Francisco, California, *Leptosphaeria heterospora* [*R.A.M.*, 32, p. 102] was frequently identified on iris rhizomes imported from abroad. Observations suggest that the fungus may occur in several localities in central and northern California on both native and introduced plants. It is probably of little or no consequence as a parasite.

Van Koot (Y.), Van Slogteren (D. H. M.), Cremer (Miss M. C.), & Camfferman (Miss J.). **Virusverschijnselen in Freesia's.** [Virus symptoms in Freesias.] —*Tijdschr. PlZiekt.*, 60, 4, pp. 157–192, 17 figs., 1954. [English summary.]

Virus infection of freesias [*R.A.M.*, 31, pp. 120, 385] is stated to have assumed considerable importance in Holland of recent years. The application of serological methods at the Bulb Investigation Laboratory, Lisse, resulted in the differentiation of two viruses [34, p. 133], the freesia virus, which is widespread in most varieties, and the less prevalent but more severe *Phaseolus* virus 2 [bean yellow mosaic virus]. In most varieties the presence of the freesia virus produces no clear symptoms, whereas leaf mosaic is a prominent feature of infection by bean yellow mosaic virus, which may also cause floral abortion. However, varietal reactions to the two viruses differ appreciably. Giant White and Prinses Irene show no external sign of infection by

the freesia virus, while bean yellow mosaic virus produces only a faint striation of the bracts. On the other hand, the lilac-blue Marion reacts to the freesia virus by a prominent mosaic. A necrosis of the corms and necrotic spotting of the leaves of the highly susceptible Snow Queen could not be definitely traced to infection by either of the viruses under observation.

Virus infection is perpetuated through the corms but apparently not by seed. The freesia virus is readily transmissible by the aphid *Macrosiphum euphorbiae* and (in the Marion variety) by cutting the peduncles with an infected knife or applying inoculum to the cuts; leaf inoculation was much less successful. Other hosts of the freesia virus are not known. There is some indication that in practice yellow mosaic infection may spread from bean [*Phaseolus vulgaris*] to freesia.

Under the electron microscope the freesia virus appeared to consist of straight, rod-shaped particles, 1 to 2·5 μ by 20 mμ, and bean yellow mosaic virus of coiled, filiform ones.

Control of the viroses should be based on stringent corm selection; avoidance of contact between healthy varieties and those carrying infection in a masked form, as well as other hosts of the bean yellow mosaic virus; and aphid extermination by fortnightly spraying of the plants with a 0·1 per cent. solution of systox or a soil application at 0·05 per cent.

Schenk (P. J.). **Het vuur van Hippeastrum.** ['Fire' of *Hippeastrum.*]—*Cult. en Hand.*, 20, 6, pp. 279–280, 1 fig., 1954.

This is a popular note on the infection of *Hippeastrum* [*Amaryllis*] by *Stagonospora curtisii* in Holland [cf. *R.A.M.*, 21, p. 18; 33, p. 138]. Control may be effected by reducing temperature and humidity to the lowest safe limit; excision of diseased material, applying charcoal dust to the wounds; and eventual spraying with 0·75 per cent. copper oxychloride (50 per cent. copper). Since the fungus is carried on the bulbs, its development may be prevented by dipping them during dormancy in a solution of 1·5 per cent. Bordeaux mixture, 0·75 per cent. copper oxychloride, or 0·25 per cent. ferbam, or by two hours' immersion in water heated to 43·5° C.

Winstead (N. N.), Nelson (E. C.), & Haasis (F. A.). **Distribution of Sclerotinia camelliae in North Carolina, 1950–1954.**—*Plant Dis. Reptr*, 38, 9, pp. 670–672, 1 map, 1954. [Multilithed.]

A survey carried out from 1951 to 1954, inclusive, showed that camellia flower blight (*Sclerotinia camelliae*) [*R.A.M.*, 34, p. 36 and next abstract] is present on 18 properties in four counties of North Carolina. The fungus is believed to have been introduced into most of these places one or two seasons prior to discovery.

Gill (D. L.) & Ridley (J.). **An outbreak of Camellia flower blight in Georgia.**—*Plant Dis. Reptr*, 38, 9, p. 673, 1954. [Multilithed.]

Camellia flower blight (*Sclerotinia camelliae*) [see preceding abstract] is reported from Augusta, Georgia [*R.A.M.*, 30, p. 109], where it has probably been present in private gardens for several years.

Gerdemann (J. W.). **Pathogenicity of Leptodiscus terrestris on Red Clover and other Leguminosae.**—*Phytopathology*, 44, 8, pp. 451–455, 2 figs., 1954.

Further information is presented on the root rot of red clover and other legumes in Illinois caused by *Leptodiscus terrestris* [*R.A.M.*, 33, p. 233]. In the laboratory the fungus sporulates only on natural media incubated in the light, the optimum temperature for growth being 30° C. with merely a trace at 10° or 35°. In greenhouse inoculation tests it induced damping-off and root rot of Ladino clover and

a number of hosts already listed [loc. cit.], while only the root rot occurred on green and Lima beans (*Phaseolus vulgaris* and *P. lunatus*). Light to reddish-brown spots were formed on the leaves of soy-bean, red clover, and lucerne sprayed with spores, the germ-tubes of which produced appressoria and penetrated the epidermal cells directly. Sown in inoculated soil at a temperature of 22° to 28°, the Midland, Kenland, and Dollard red clover varieties were completely susceptible to damping-off, which caused little damage, however, at 10° to 15°. Root rot of older plants at 20° to 25° was most severe in Dollard, intermediate in Midland, and mild in Kenland.

Corbetta (G.). **Il 'carbone' del Panicum crus-galli e Panicum erectum prodotto da Sorosporium bullatum Schroet.** [The 'smut' of *Panicum crus-galli* and *Panicum erectum* produced by *Sorosporium bullatum* Schroet.]—*Phytopath. Z.*, 22, 3, pp. 275–280, 6 figs., 1954. [German summary.]

Panicum [*Echinochloa*] *crus-galli* and *P. erectum* in the Alto Vercellese region of Italy have been affected for some years by a smut producing on the caryopses and scattered irregularly over the ears small tumours enveloped in a greenish membrane containing free or agglomerated spores. The causal organism, first described by Schroeter from Germany as *Sorosporium bullatum*, was subsequently designated *Tolyposporium bullatum* [*R.A.M.*, 24, p. 62], but the author is persuaded that the species occurring in Italy is identical with Schroeter's and prefers to use the original name on grounds of priority. The sori, numbering up to 20 on an ear, measure 1·5 to 3 or occasionally as much as 4 by 1 to 2 mm., and the dark yellow to brown, echinulate chlamydospores 15 to 32 (mostly 20 to 22) μ in diameter.

Attempts to induce chlamydospore germination in various media were uniformly unsuccessful, and further studies are necessary to determine the precise mode of infection.

Blumer (S.). **Viruskrankheiten an Obstbäumen.** [Virus diseases of fruit trees.]—*Schweiz. Z. Obst- u. Weinb.*, 63, 25, pp. 516–519; 26, pp. 525–529, 4 figs., 1954; 64, 1, pp. 2–11, 11 figs., 1955.

Following an introduction dealing in general with published information on symptoms, transmission, and control of the known or suspected viroses of fruit trees in Switzerland [*R.A.M.*, 33, p. 304 *et passim*], observations are given on apple mosaic, affecting chiefly the Boskoop, Gravensteiner, and Golden Delicious varieties; flat limb, occurring on Gravensteiner, Schneider, Tobiäsler, and Ontario apples and also on quinces; witches' broom [cf. 32, p. 681], fairly prevalent both in nurseries and on older apple trees; rubbery wood [cf. 30 p. 167], reported recently by R. Bovey on Golden Delicious apples in western Switzerland; pear mosaic [18, p. 746], severe and fairly common on Neue Poiteau, indistinct on Josefine von Mecheln, and latent in Beriker; cherry ring spot [31, p. 498]; a rosette disease of cherry recognizable by progressive defoliation of the interior of the crown, reduction of shoot growth, and the production at the branch tips of small, faintly chlorotic leaves [cf. 34, p. 41]; an apparently non-transmissible variegation of Rigi (Lauerzer) cherry, characterized by the development of small, densely aggregated, pale green, later whitish, mosaic-like leaf spots, commonly delimited by the finest reticulations of the veins; and crinkle [31, p. 224] on cherry seedlings and standards, especially Muscatel.

Woodbridge (C. G.). **Zinc deficiency in fruit trees in the Okanagan Valley in British Columbia.**—*Canad. J. agric. Sci.*, 34, 6, pp. 545–551, 7 pl., 1954.

Descriptions are given of zinc deficiency symptoms in apple, pear, cherry, peach, apricot, and prune trees in the Okanagan Valley, British Columbia [*R.A.M.*, 33,

p. 708]. The deficiencies vary in severity in different orchards, in some causing serious losses, in others being recognizable only at certain times of the year. On apple [30, p. 275; 31, p. 50] opening of the buds is retarded and in severe cases trees develop poorly, producing undersized fruit. A late dormant spray of zinc sulphate (20 lb. per 100 gals.) gave satisfactory control in all the trees except cherry.

Keitt (G. W.) & Boone (D. M.). **Induction and inheritance of mutant characters in Venturia inaequalis in relation to its pathogenicity.**—*Phytopathology*, 44, 7, pp. 362–370, 3 figs., 1 graph, 1954.

Reference has already been made in this *Review* to most of the 45 studies on the inheritance of pathogenicity in *Venturia inaequalis* [*R.A.M.*, 32, p. 386; 33, p. 487, *et passim*] cited in the authors' survey of the subject presented at the Symposium on Genetics of Phytopathogenic Fungi in Relation to Basic Problems of Infectious Disease at Madison, Wisconsin, on 7th September, 1953. The results so far obtained in biochemical investigations on the fungus [loc. cit.] are interpreted as denoting that its capacity to synthesize certain vitamins, nitrogen bases, and amino acids may be of critical significance from the pathogenic standpoint.

Jenkins (P. T.). **The control of summer spot of Pears.**—*J. Dep. Agric. Vict.*, 52, 12, pp. 567–569, 572, 2 figs., 1954.

This information concerning the control of black spot of pears [*Venturia pirina*] in Victoria from 1950 to 1953 has already been noticed from other sources [*R.A.M.*, 32, p. 24; 33, p. 32].

Dunegan (J. C.), Kienholtz (J. R.), Wilson (R. A.), & Morris (W. T.). **Control of Pear blight by a streptomycin-terramycin mixture.**—*Plant Dis. Reptr*, 38, 9, pp. 666–669, 1 graph, 1954. [Multilithed.]

At Marysville, California, Bartlett pear trees were treated against blight (*Erwinia amylovora*) [*R.A.M.*, 33, p. 609; cf. 34, p. 97] with streptomycin-terramycin mixtures (agrimycin 100) at 100·10, 60·6, and 30·3 p.p.m., either three or four times every 14 days or five or seven times at 7-day intervals, starting on March 29th. Spraying was conducted from the ground with a 4-nozzle broom at 600 lb. pump pressure. The sprays were effective at all concentrations, even the lowest (five applications) giving control comparable with that obtained with tribasic copper sulphate, and caused no fruit injury; leaf chlorosis occurred, but at the lowest concentration only in traces. Similar results were obtained with agrimycin 200 (35 per cent. streptomycin), applied with a speed sprayer.

Bould (C.). **Chelated iron compounds for the correction of lime-induced chlorosis in fruit.**—*Nature, Lond.*, 175, 4445, pp. 90–91, 1954.

Further experiments were conducted in 1954 at Long Ashton Research Station, Bristol, on the use of iron chelates for correcting lime-induced chlorosis in fruit [cf. *R.A.M.*, 33, p. 661] on a highly calcareous soil of pH 7·8. Ferric disodium ethylene diaminetetraacetate (Fe-EDTA) [loc. cit.] and ferric diethylene triaminepentaacetate (DTPA), applied in solution round the trees at a radius of 3 ft. from the base at a rate of 8 oz. per tree, controlled chlorosis completely and resulted in vigorous extension growth, but there was no visible response to ferric N-hydroxyethyl-ethylenediamine-triacetate. Burbank's Giant Prune plum trees did not respond to soil treatments but three foliage sprays of all three salts at 0·1 per cent. plus wetter gave commercial control of chlorosis and, except for slight marginal and tip scorch produced by Fe-EDTA, caused no damage. Peach leaves were completely normal three weeks after receiving a single foliage spray of DTPA and

have remained so ever since. This method is more economical than soil treatments. Pear leaves are more difficult to wet and more susceptible to damage than plum, apple, or peach.

Wright (W. R.) & Smith (M. A.). **Diplodia fruit rot of Peaches.**—*Phytopathology*, 44, 8, pp. 471–472, 1 fig., 1954.

During 1951 *Diplodia natalensis* was detected in 11 lots of Pearson Hiley, Early Hiley, Southland, and Elberta peaches [*R.A.M.*, 4, p. 722; cf. 33, p. 349] inspected in Georgia in connexion with post-harvest treatments for the control of diseases in transit and market, the percentage of infection ranging from 0·1 to 10·4, with an average of 2·8. In July, 1953, the fungus was also isolated from mature Elberta peaches in South Carolina, this being apparently the first record of its occurrence in that State. The minimum, optimum, and maximum temperatures for the growth of peach isolates on potato dextrose agar were 45° to 50°, 85°, and 102° F., respectively. Typical *Diplodia* rot lesions developed on healthy peaches inoculated through wounds or by spraying with aqueous spore suspensions.

Gilmer (R. M.). **Insect transmission of X-disease virus in New York.**—*Plant Dis. Reptr*, 38, 9, pp. 628–629, 1 fig., 1954. [Multilithed.]

At the New York State Agricultural Experiment Station, Geneva, in 1952, adults of *Colladonus clitellarius*, previously caged on small chokecherry (*Prunus virginiana*) seedlings experimentally inoculated with a strain of X-disease virus [peach X-virus: *R.A.M.*, 33, p. 735] contaminated with [cherry] necrotic ring spot virus, were confined to a group of 25 chokecherry seedlings for 35 days. Three seedlings developed initial symptoms of X-disease a year later and anthocyanosis in 1954, indicating that *C. clitellarius*, though relatively uncommon, is partially responsible for field transmission of the virus in New York. The leafhopper appears to prefer *Prunus* spp., particularly chokecherry and plum, though it has been observed on a number of other plants.

Bovey (R.). **La chaleur, moyen de lutte contre les maladies à virus des plantes.** [Heat, a control method against virus diseases of plants.]—*Rev. rom. Agric.*, 10, 8, p. 65, 1954.

The author briefly reviews work done on heat treatments for the cure of virus diseases [see next abstract]. In tests carried out at the Swiss Federal Agricultural Experiment Station, Lausanne, in summer 1953, with the strawberry variety Madame Moutot, the best results were obtained with a temperature of 37° C. over ten days. Of 700 strawberry plants so treated, the proportion of cured plants sometimes amounted to 50 and 37·5 per cent., though the average was only 5·4 per cent. The treatment cannot yet be applied on a commercial scale, but it has permitted the restoration to health of clones of varieties including Madame Moutot, Perle de Prague, Madame Lefèbvre, and Huxley, of which only infected material was available hitherto.

Bovey (R.). **Guérison de Fraisiers, atteints de virus, par traitement thermique.** [Cure of virus-infected Strawberries by heat treatment.]—*Annu. agric. Suisse*, (68), N.S. 3, 9, pp. 1041–1047, 3 figs., 1954.

Of 698 Madame Moutot and Surprise des Halles strawberry plants treated by heat at one of the Lausanne agricultural experiment stations for the inactivation of viruses, 176 survived and 38 (5·4 per cent.) were cured [cf. preceding abstract]. So far, the most effective combination of temperature and duration of treatment is 37° C. for 10 days.

SMITH (H. E.). **New Strawberry disease in Arkansas.**—*Plant Dis. Reptr*, 38, 9, pp. 630–631, 1 fig., 1954. [Multilithed.]

A disease of strawberry plants, new to Arkansas, was observed in 1953 on a few individuals and again in 1954 when it affected up to 20 per cent. of the plants (mostly Blakemore) in some fields, particularly in young, vigorous plantings one or two years old. The cause of the disease is still unknown. The most common symptoms were upward curling of the old leaves and dwarfing, cupping, and marginal chlorosis of the young ones, reddening of the petioles and stolons, and shrivelling of the fruit when still green. A few plants developed symptoms similar to those of western aster yellows virus [*R.A.M.*, 32, p. 683] or chlorotic phyllody [31, p. 337]; others wilted suddenly and died.

MATUO (T.). **Studies in the concepts of the species and the physiologic form in Fusarium causing the bud blight of Mulberry trees.**—*J. Fac. Text. Seric., Shinshu Univ.*, [Ser. A], 1, 1, pp. 45–81, 2 pl., 1951. [Received 1954.]

In this investigation at the Laboratory of Phytopathology and Mycology, Shinshu University, Ueda, Japan, a comparison was made of the cultural characters, morphology, and pathogenicity of 34 strains of *Fusarium* isolated from mulberry trees [see following abstracts], a strain from *Broussonetia kazinoki*, and one isolated from *Rubus* sp. in Holland identified as *F. lateritium* (*Gibberella lateritia*). All the strains were tested by wound inoculation of the stems and were pathogenic to mulberry trees. The author concurs with Snyder and Hansen in grouping them all in *G. lateritia* and he adds to the specific diagnosis the character of the rare production of pyriform microconidia. He considers differences in pathogenicity to be the principal criteria in separating forms, other factors being significant only when they support such differences.

MATUO (T.). **Pathological studies of the 'bud blight' of Mulberry trees I. On the occurrence and development of the disease. II. On the influence of manure upon the development of the disease and the formation of sporodochia and perithecia of the causal fungus.**—*J. Fac. Text. Seric., Shinshu Univ.*, Ser. A, [?2], 2, pp. 1–43, 3 pl., 7 graphs, 1952; [?3], 3, pp. 15–54, 1 pl., 1953. [Received 1954.]

In three years' experiments in inoculating mulberry trees at Ueda, Japan, with the bud blight or 'megare' organism, *Gibberella lateritia* [see preceding and next abstracts], sporodochia were formed from March to December, most vigorously in mid-summer. The perithecial stromata were formed every month, particularly in June and August. Inoculations of wounded stems in autumn and early winter were the most destructive. Inoculation of the cut petiole base after removal of the leaves resulted in slight invasion at the junction of the petiole and stem. In regions of heavy snowfall some of the damage hitherto attributed to *Diaporthe nomurai*, the agent of blight or 'dogare disease' [cf. *R.A.M.*, 10, p. 567] is, in fact, due to *G. lateritia*. Both pathogens enter through the lenticels. The wound periderm has an important defensive function against invasion by these fungi but is not the only factor involved. In areas of slight snowfall, where *G. lateritia* is the more frequent, infection originates from wounds on the stem surface. The conidia of *D. nomurai* are influenced by moisture at germination far more than those of *G. lateritia*, requiring a relative humidity of 100 per cent. *in vitro* except when the incubation period was prolonged, whereas some germination occurred in *G. lateritia* even at 89 per cent. This fact may be related to the difference in the occurrence of the two diseases.

In further tests nitrogenous fertilizer applied to potted mulberry seedlings promoted the development of *G. lateritia* slightly during the summer growth period

and also sporodochial formation. Wound periderm formation was promoted by potassium fertilizer. Since the amino acids produced by hydrolysis of the proteins in the bark all promoted sporodochial formation the author concludes that the observed differences in the amount of protein in the bark of mulberry stems in nitrogen and potassium-fertilized plots influenced spore formation by the fungus on the stems.

Matuo (T.) & Shioiri (T.). **On the relation between the effect of ultra short waves upon the germination of the macroconidia of Gibberella lateritia (Nees) S. et H. and the temperature.**—*Res. Rep. Fac. Text. Seric., Shinshu Univ.*, 1, pp. 47–52, 3 graphs, 1951. [Japanese, with English summary. Received 1954.]

In further experiments at the Faculty of Textiles and Sericulture, Shinshu University, Japan, the effect of ultra short waves (2 m. and 5 m., exposure period 60 minutes) on the germination of macroconidia of *Gibberella lateritia* from mulberry [*R.A.M.*, 33, p. 97 and preceding abstract] was to reduce the percentage germination from a mean of 84·7 to 3·5. Exposure to a temperature 38° C. for 60 minutes reduced it from a mean of 85·6 to 64·9. In a test made in October with an air temperature of 14° to 16° 30 irradiations of 1 minute each at 1-minute intervals reduced the mean percentage germination from 93·8 to 67·1, whereas in November with an air temperature of 5° to 7° germination increased from 97·4 per cent. to 98·7 per cent. The control of *G. lateritia* by the use of ultra-short waves would appear, therefore, to be difficult.

Tims (E. C.), Mills (P. J.), & Exner (Beatrice). **Thread-blight (Pellicularia koleroga) in Louisiana.**—*Plant Dis. Reptr*, 38, 9, pp. 634–637, 2 figs., 1954. [Multilithed.]

Thread blight (*Corticium koleroga*) is stated to be the most important disease of figs in Louisiana [*R.A.M.*, 21, p. 296]. Partial defoliation of many trees occurs in the southern part of the State during the summer and if the fruit is then still immature it fails to ripen. Growth of the trees is only slightly affected. One or two applications of tribasic copper sulphate (4–100) in late May or early June gave good control until after the fruit ripened in July. A list is given of 33 other plants, including tung (*Aleurites fordii*) [22, p. 459; 28, p. 365], attacked by thread blight in the State.

McDonnell (C. C.). **Insecticides and fungicides.**—*Agric. Chemic.*, 8, 2, pp. 50–52, 123, 1953.

This list contains the full chemical name, active ingredients, and the common name, trade name, or interim designation approved by the Committee on Insecticide Terminology of the American Association of Economic Entomologists for 52 complex organic plant protectants, including the following fungicides: chloranil (= spergon), captan, ferbam, nabam, zineb, ziram, and thiram [cf. *R.A.M.*, 31, p. 562].

Courshee (R. J.). **Pressure regulation on spraying machinery. A review of the fundamental differences and performances of the main methods.**—*Agric. Mach. J.*, 8, 6, pp. 79–80, 4 figs., 1954.

Following the increasing use of knapsack sprayers where wheeled vehicles are unsuitable, the World Health Organization has recommended that they should be fitted with pressure regulators. Four types of valve, suitable for use on hand- as well as power-sprayers, are briefly described, each having different fundamental principles. The first type is a reducing valve which delivers liquid at a constant pressure lower than that from the pump; the second is a reducing valve with a

by-pass which returns surplus liquid to the tank at a low pressure; the third is a simple automatic regulating valve which cuts off the supply by means of a flexible diaphragm if the pressure becomes too great, and may be most widely used in knapsack sprayers; the fourth type is a regulator with a by-pass overflow for excess spray to be returned to the tank, and is most suitable for intermittent spraying.

SUZUKI (T.). **Quantity of deposition of spray liquid on leaf surface. (Studies on the physical properties of agricultural chemicals IX.)**—*J. agric. chem. Soc. Japan*, 27, 6, pp. 372-376, 2 figs., 2 graphs, 1953. [Japanese, with English summary. Received 1955.]

In a study of the factors contributing to maximum adhesion of spray materials on leaf surfaces, carried out at the National Institute of Agricultural Sciences, Japan, it was shown that the maximum adhesive quantity V may be represented as $\frac{k\sqrt{s}}{\sqrt{\pi}}$, where k is $\frac{2\pi\sigma(1+\cos\theta_r)}{\rho g}$, s is the unit area of leaf, σ the surface tension and ρ the density of spray liquid, and θ_r the receding contact angle.

Adhesion is completely uniform when $V = \frac{s-a}{b}$, where b is the spreading index and a is a constant; a, b, and θ_r vary with different plants and with the spreader used. The value of V increases with size and roughness of the leaf. Higher concentrations of spray must be applied with decrease in V.

HILBORN (M. T.). **Applicators' problems of formulation.**—*Agric. Chemic.*, 8, 1, pp. 41–42, 125, 1953.

This paper was read at the annual meeting of the American Phytopathological Society held at Ithaca, New York, on 9th September, 1952. Important factors to study in formulating a fungicide [*R.A.M.*, 34, p. 161 and next abstract], and on which its nature and potential effectiveness in the field depend, are the active ingredients, spray supplements, proportions of the various components, method of combining them, and treatment of the mixture up to the time it is applied. Considerable difficulty is encountered in manufacturing and field formulation owing to the amount of testing required. The author concludes that more adequate testing of a material in the early stages of development would aid field experiments considerably. Manufacturers should consider the specialized requirements sometimes needed for the control of certain diseases. It may also be well to utilize the possible effect of formulating more than one active ingredient in combination, or of using some other chemical known to have synergistic effects.

HARRY (J. B.). **Manufacturers' problems of fungicide formulation.**—*Agric. Chemic.*, 8, 2, pp. 42–45, 1953.

In this paper presented at the annual meeting of the American Phytopathological Society, held at Ithaca, New York, on 9th September, 1952, the author lists the major problems to be solved before a new fungicide formulation [see preceding abstract] is considered acceptable. It should be readily wettable and dispersible and adapted to many kinds of application equipment, store safely for at least two years, be fairly harmless to use with no deleterious residues, be acceptable with regard to colour and smell, not reduce the effectiveness of the toxicant, not injure or disfigure the crop or damage the equipment, be compatible with many other chemicals such as insecticides, herbicides, and nutrients [*R.A.M.*, 33, p. 514], be produced at an economical yet profitable cost, and, above all, satisfy the diverse requirements of a wide range of users.

The complexity of these problems calls for a logical, co-ordinated research programme conducted by an integrated team of formulation experts.

Schroth (E.). **Über die Spritztechnik mit Motorspritzen.** [On spraying methods with motor sprayers.]—*Pflanzenarzt*, 7, 9, pp. 1–2, 2 figs., 1954.

This is a discussion of common mistakes observed in the handling of motorized sprayers when spraying fruit trees in Austria, such as careless wielding of the pipes, too close approach to the trees, using unduly low pressure, and incorrect or inflexible nozzle adjustment. The author recommends rational and systematic spraying from four different positions for each tree and at varying angles, moving slowly at a distance which ensures wide enough coverage and consequently speedier work; finally he recommends the use of short, light pipes.

Stakman (E. C.). **People, pathogens, and progress in international disease control.** —*Phytopathology*, 44, 8, p. 421, 1954.

In this paper, presented at the Symposium on Agricultural Research in the Western Hemisphere at Madison, Wisconsin, on 9th September, 1953, the author outlines the problem of the control of plant diseases on an international basis.

Research work and workers.—*Seed World*, 75, 7, p. 16, 1954.

Fusarium brown rot [*F. oxysporum* f. *gladioli*: *R.A.M.*, 33, p. 483] is reported to be destroying annually 50,000,000 gladiolus corms over an area of 8,000 acres in Florida. Control measures in the field include replacement every third or fourth year with the healthiest corms from planting stocks, growing cover crops in two out of three years, and using resistant varieties. In storage the best control is obtained by soaking corms for 10 to 15 minutes in dowicide B (2 lb. in 50 gals. water plus 1½ cups of a wetting agent) [cf. 33, p. 725].

Seed of Dollard [see above, p. 230], a new red clover variety resistant to four forms of anthracnose [*Kabatiella caulivora* and *Colletotrichum trifolii*: 33, p. 676] and 'standing up well' to black stem [*Phoma trifolii*: loc. cit.], is expected to be available in 1955.

In Oklahoma field trials zineb or nabam sprays and dusts gave good control of watermelon anthracnose [*Colletotrichum lagenarium*: 32, p. 26].

Les maladies des plantes. [Plant diseases.]—*Agriculture, Montréal*, 9, 4, pp. 309–466, 47 figs., 1952.

This number is devoted entirely to papers dealing with plant pathological problems in Quebec [*R.A.M.*, 34, p. 135 *et passim*]. The titles are as follows: The protection of crops against disease, by A. Hamel (pp. 315–317); The economic importance of plant diseases in Quebec, by E. Campagna (pp. 318–324); Parasitism and plant diseases, by A. Payette (pp. 325–329); Are micro-organisms or insects responsible?, by J. Duncan (pp. 330–333); The effect of environment on parasitic diseases of plants, by L.-J. Coulombe (pp. 334–346); Physiogenic diseases, by R.-O. Lachance (pp. 347–355); Diseases of cereals, by D. Leblond (pp. 356–366); Diseases of forage plants, by R.-O. Lachance (pp. 367–371); Apple scab, by R. Desmarteau (pp. 372–379); Diseases of small fruits, by H.-N. Racicot and J.-B. Julien (pp. 380–386); A brief survey of legume diseases, by E. Lavallée (pp. 387–391); Potato diseases, by H. Généreux (pp. 392–400); Some problems of the phytopathology of ornamentals, by J.-E. Jacques (pp. 401–404); Diseases of trees in privately-owned forests, by R. Pomerleau (pp. 405–417); The production of disease-resistant varieties, by L. Dessureaux (pp. 418–423); How to control apple scab, by L. Cinq-Mars (pp. 424–430); The plant protection service in action, by L. Laporte (pp. 431–434); Preventive methods against parasites of cultivated plants, by B. Baribeau (pp. 435–445); Fruit and vegetable inspections, by H. Marshall (pp. 446–447); The spread of plant pathological knowledge among Quebec growers, by T. Simard (pp. 448–450); The growth of agricultural phytopathology in Quebec province (Anon., pp. 451–455); and Statistical problems applied to agriculture and rural economy, by J.-C. Magnan (pp. 456–458).

Abe (M.), Yamano (T.), Kozu (Y.), & Kusumoto (M.). **Researches on ergot fungus. Part 20. Isolation of a mutant productive of agroclavine rather excellently even in submerged culture.**—*J. agric. chem. Soc. Japan*, 27, 1, pp. 18–23, 4 graphs, 1953. [Japanese, with English summary. Received 1955.]

In studies at the Institute for Fermentation, Osaka, Japan, a mutant strain, A 11, of *Claviceps purpurea* [see above, p. 224] from *Agropyron*, obtained by radium treatment, produced more agroclavine than the parent strain. All had lost the ability to parasitize the host and proved more aerobic in culture than the original.

The authors consider that any classification of ergot fungi should take into consideration the principal alkaloid produced. All the races of *C. purpurea* studied have been found to produce agroclavine, elymoclavine, and an unknown water-soluble alkaloid, in addition to ergometrine and peptide-type alkaloids.

Cuckow (F. W.). **Fixation in electron microscopy.**—*Nature, Lond.*, 175, 4446, p. 131, 1955.

Losses of material and changes of aggregation during the preparation of specimens for electron microscope studies were largely overcome at the Chester Beatty Research Institute, Royal Cancer Hospital, London, by working on a microscale and using the mounting film itself as the dialysis membrane. The film was floated from a glass support on to a water surface and a single drop, or spray of micro-drops, of the preparation placed on top. The salts diffuse through very rapidly. To fix without altering the electrolyte balance, the mounting film was floated on a bath of the suspending medium containing the fixative. Unused fixative and unwanted salts were removed by transferring the film to a water surface as before. This method has been employed successfully during the past two years in studying tumour and normal tissue extracts, isolated cell components, and bacteriophage behaviour at various pH levels.

Bache-Wiig (Sara). **The fungistatic barrier effect of 'S-coated' Cotton used as vial plugs.**—*Mycologia*, 46, 4, pp. 457–462, 1954.

In experiments conducted in the Department of Botany, Smith College, Northampton, Massachusetts, in 1946 to devise a method of keeping cultures of dissected *Datura* embryos free from fungal contamination during humid summer weather, two 'S-coatings' developed by Dr. A. Goetz and his collaborators at the California Institute of Technology (*Science*, 95, pp. 537–538, 1942; *Mod. Packag.*, 18, pp. 113–115, 148, 150, 1944) were tested. S-coating, before surface application, consists of a paint-like fluid which is an intimate mixture of non-absorptive colloidal carbon (particles 90 mμ, each carrying traces of silver in a controlled chemi-sorbed state) and a scarcely soluble inorganic peroxide which acts as oxygen donor, suspended in a plastic vehicle which on drying forms micellae; these hold the pigment particles in the surface layer but permit the establishment of 'wetting bridges' between the particles. An insoluble surface configuration is thus produced, which is germicidally active for very long periods in the sense that it inactivates micro-organisms which come into contact with the surface. All the embryo cultures (in vials) were kept in moist, closed, fungus-contaminated glass dishes. Some were also given an initial inoculation on the top of each plug with spores of *Aspergillus* sp. All vials plugged with material other than S-coated cotton became contaminated before any of the treated ones showed fungal invasion.

In 1952 further tests were made, the S-coated cotton plugs being rolled by hand, wetted in sterile distilled water, and then squeezed, as S-coated material, bacteristatic and fungistatic in the dry state at room temperature, becomes highly bactericidal for a time when wet, and should sterilize itself in a minute or two. Fungal contamination of vials plugged with cotton recently impregnated with

S-coatings was first observed 42 or more days after all the controls had become contaminated; some vials plugged with S-coatings appeared to be uncontaminated even after 154 days. When S-coatings stored for six years were used, contamination occurred later than in the controls, but earlier than with recent S-coatings.

Stalder (L.). **Über die Verwendungsmöglichkeiten von Antibiotika im Pflanzenschutz.** [On the possibilities of applying antibiotics in plant protection.]—*Schweiz. Z. Obst- u. Weinb.*, 64, 2, pp. 28–31, 1954.

From a survey of the literature (14 titles) the author concludes that it would be uneconomic at present to use antibiotics for the control of plant diseases in the Swiss horticultural and viticultural industries.

Lockwood (J. L.), Leben (C.), & Keitt (G. W.). **Production and properties of antimycin A from a new Streptomyces isolate.**—*Phytopathology*, 44, 8, pp. 438–446, 1 fig., 1 graph, 1954.

A crystalline anti-fungal antibiotic, antimycin A-102, isolated at the Department of Plant Pathology, University of Wisconsin, from cultures of strain 102 of *Streptomyces* sp. [*R.A.M.*, 33, p. 369], differs slightly from antimycin A-35, produced by another strain of the same species [29, p. 524; cf. 33, p. 92]. Both contain varying proportions of four active components, designated A_1, A_2, A_3, and A_4. In agar-streak tests antimycin A-102 in the partially purified and crystalline states reduced the growth of nearly all the fungi tested, including *Alternaria solani* [see next abstract], *Glomerella cingulata*, *Helminthosporium sativum*, and *Ustilago striiformis*, but total inhibition was not achieved, even at high concentrations. Sometimes the pH of the soy-bean-meal–glucose medium affected the level of inhibition obtained at a concentration of 16 μgm. per l., the maximum degree of activity against *A. solani*, *G. cingulata*, and *U. striiformis* being exerted at 3·6, while *H. sativum* was more sensitive at 6·9 and 8·5.

Aqueous suspensions of partially purified antimycin A-102 gave average ED 50 and ED 95 values of 23 and 297 μgm. per ml., respectively, in greenhouse tests to protect tomatoes against *A. solani* [28, p. 635]. After washing with simulated rain (equivalent to 2·5 cm.), 55 per cent. of the active material remained on the foliage compared with 70 per cent. on unwashed leaves after four days. Applied as a spray at the rate of 2·9 mg. per ml., antimycin A-102 caused no damage to various species of plants, including cereals, tomato, and several vegetables. In seed treatment tests the partly purified antibiotic in ethanol was effective in the control of *H. victoriae* on oats.

On the basis of higher yields and a simpler purification procedure *Streptomyces* 102 appears to be superior to 35 for the production of the antimycin A complex.

Banerjee (A. K.), Mukherjee (S. K.), & Nandi (P.). **Production of antifungal substances by Streptomyces spp. isolated from Indian soil.**—*Sci. & Cult.*, 20, 3, pp. 141–143, 1954.

In preliminary screening tests at the Department of Microbiology, Bose Research Institute, Calcutta, of the 196 strains of different species of *Streptomyces* [see preceding abstract], isolated from 50 soil samples collected from different parts of India and tested by the cross-streak method, using modified Czapek-Dox agar medium and six test fungi, 128 were found to have antifungal activity of varying degrees against one or more of these fungi. Of these strains 121 were grown in 50 ml. modified straw infusion-dextrose broth, to find whether they could produce antibiotics in the liquid medium as well. Only 42 produced a certain amount of antibiotic. Of the test fungi *Aspergillus oryzae*, *Curvularia* sp., and *Helminthosporium oryzae* were more susceptible to antagonism by *Streptomyces* spp. than *Verticillium* sp., *Fusarium* sp., or *Alternaria solani*.

Sharon (N.), Pinsky (A.), Turner-Graff (R[uhama]), Babad (J.), & Cercós (A. P.). **Classification of the antifungal antibiotics from Bacillus subtilis.**—*Nature, Lond.*, 174, 4443, pp. 1190–1191, 1954.

In this joint contribution from the Dairy Research Laboratory, Rehovot, Israel, and the Institute of Microbiology, Buenos Aires, Argentina, the authors review from the literature the properties of nine antifungal antibiotics produced by *Bacillus subtilis* [*R.A.M.*, 31, p. 621; 33, p. 105] and compare those of substances I, II, and III by paper chromatography. Substances I (bacillomycin R) and III (fungocin or bacillomycin A) completely inhibited the growth of *Aspergillus niger* at 25 to 50 μgm. per ml., while II (bacillomycin) inhibited *A. niger*, I *Botrytis cinerea*, and I and III *Fusarium* sp. at 50 to 100 μgm. per ml. The three other antifungal polypeptides of *Bacillus subtilis* differ from the other nine in that fungistatin (antibiotic XG) [31, p. 528] is an amphoteric polypeptide containing basic amino acids and tryptophane; mycosubtilin [29, p. 524] is intracellular, insoluble in the lower aliphatic alcohols, does not contain glutamic acid and serine, and has an acid equivalent weight of 1,980; and '*Rhizoctonia* factor' [28, p. 533] is dialysable, insoluble in butanol and ethanol, and inactive against *A. niger*.

It is suggested that substances I, II, and III and the six similar substances (eumycin, toximycin, bacillomycin B, '*Aspergillus* factor', and unnamed VIII (*Dermatologica*, 100, p. 45, 1950) and IX [*R.A.M.*, 33, p. 105] should be classified together under 'bacillomycin', and it has been agreed that the name bacillomycin A should be adopted for fungocin [32, p. 329].

Kooiman (P.), Roelofsen (P. A.), & Sweeris (S.). **Some properties of cellulase from Myrothecium verrucaria.**—*Enzymologia*, 16, 4, pp. 237–246, 1 diag., 1 graph, 1953. [French summary.]

In experiments at the Technical University of Delft, Holland, part of the cellulase excreted in the culture filtrate of the cellulolytic fungus *Myrothecium verrucaria* [cf. *R.A.M.*, 34, p. 171] withstood prolonged boiling and even brief exposure to temperatures of 110° and 120° C. It hydrolysed native cellulose, rayon, cellodextrins, and the oligosaccharides down to cellobiose, producing cellobiose and glucose in the process. The culture filtrate also contained a cellobiase and a transglycosidase forming a triose from cellobiose. Both enzymes (which may be identical) were eliminable by boiling.

Bovay (E.). **Les dépôts de chlore et de fluor sur la végétation dans le voisinage des usines de produits chimiques.** [Deposits of chloride and fluoride on the vegetation in the neighbourhood of chemical factories.]—*Rev. rom. Agric.*, 10, 9, pp. 69–71, 2 figs., 2 graphs, 1954.

Observations carried out by the Swiss Federal Agricultural Experiment Stations in the summers of 1952 and 1953 in the neighbourhood of five electrochemical factories in the Rhône valley showed that vines and apricot, lime [*Tilia*], pine, and chestnut trees are sensitive to fluorine gas, while apple and especially pear are fairly resistant. Apricot trees were particularly sensitive and the presence of 3 mg. of fluorine per 100 gm. dry matter caused burns on the leaves, leading to partial defoliation. Chlorine had no harmful effect. Trees sheltered from the fumes by houses or hills remained unaffected.

Otto (G.). **Beiträge zur Morphologie und Frage der Bedeutung der endotrophen Mykorrhizen bei Obstgehölzen.** [Contribution to the morphology and question of the significance of the endotrophic mycorrhiza in fruit trees.]—*Naturwissenschaften*, 41, 23, pp. 555–556, 1 fig., 1954.

In nearly all the orchards visited by the author from the Institute for Fruit Culture and Breeding of the German Academy of Agricultural Sciences, near

Potsdam, Berlin, endotrophic mycorrhiza [cf. *R.A.M.*, 31, p. 622] were prevalent on the stone and pome fruit trees. Entering the cortex through or between the outer layer of cells, the hyphae may spread intercellularly, with branches which mostly penetrate the nearest root cell and there terminate in typical arbuscules [? of *Rhizophagus*: 26, p. 505]. Alternatively, a root cell may be penetrated directly, traversed, and the next invaded, and so on, ending again in arbuscule development. Vesicles are formed inter- and intracellularly, frequently becoming separated from the hyphae, remnants of which adhere to them.

The examination of numerous sections of *Malus* roots invaded by mycorrhiza revealed virtually no connexion between the inner and outer mycelium which might serve for the transport of materials to the host [cf. 33, p. 372], each part being apparently independent of the other. It was further observed that intensive mycorrhizal infection was a concomitant of 'soil sickness' in nurseries, and further studies are planned to investigate the possibility of a causal relationship.

Stone (E. L.) & McAuliffe (C.). **On the sources of soil phosphorus absorbed by mycorrhizal Pines.**—*Science*, 120, 3127, pp. 946–948, 1 graph, 1954.

In studies at the Department of Agronomy, Cornell University, Ithaca, New York, phosphorus-deficient Monterey pine seedlings [*Pinus radiata*] were grown in two prairie soils naturally lacking mycorrhizal fungi, with the addition of labelled phosphorus (as potassium dihydrogen phosphate) at the rates of 10 and 100 lb. per acre [cf. *R.A.M.*, 33, p. 747]. Some were inoculated with segments of mycorrhizal pine root. One week later Italian rye grass [*Lolium multiflorum*] was sown in designated treatments with and without pines. At the conclusion of the experiment all pine seedlings with appreciably increased dry weight or phosphorus content were mycorrhizal, though no non-mycorrhizal ones had responded. The increased total phosphorus associated with mycorrhizal formation is linearly related to uptake from the inorganic addition. The relationship is affected by soil and rate of addition but not by duration or extent of mycorrhizal activity as reflected in total phosphorus content.

It would appear that in each of the four combinations of soil and fertilizer the rye grass and mycorrhizal pine seedlings utilized the added inorganic phosphorus and native sources to a closely similar extent. It is concluded that the mycorrhizal roots possessed no exceptional facility for utilizing phosphorus from the soil organic matter.

Satomura (Y.). **Biochemical studies on Sclerotinia libertiana. Part 8. II. Pectic enzymes. (ii) Degumming action of Ramie fibre by raw extract of fungus bran culture.**—*J. agric. chem. Soc. Japan*, 27, 1, pp. 15–18, 1953. [Japanese, with English summary. Received 1955.]

At the Laboratory of Zymology and Industrial Fermentation, Kyushu University, Japan, it was found that a dilute extract from the dried mycelium of a bran culture of *Sclerotinia libertiana* [*S. sclerotiorum*: cf. *R.A.M.*, 34, p. 101] contained enzymes with a strong degumming action on ramie [*Boehmeria nivea*] fibre. The action proceeded favourably at 24° C., higher temperatures causing the inactivation of the pectinases in the extract.

Fergus (C. L.). **The production of ethylene by Penicillium digitatum.**—*Mycologia*, 46, 5, pp. 543–555, 3 figs., 9 graphs, 1954.

In studies at Pennsylvania State College of ethylene production [*R.A.M.*, 33, p. 508] by *Penicillium digitatum* it was found that the fungus does not require any specific nitrogen source to produce ethylene. If organic and inorganic nitrogen compounds permitted growth, ethylene was produced. No specific carbon source

was necessary. Considerable growth resulted when acetic or pyruvic acid was added after growth had been established, though none occurred when the acids were added at the start. Citric, malic, lactic, and succinic acids allowed ethylene production, but acetic, pyruvic, and fumaric acids and ethanol did not.

Ethylene production followed a regular course under different cultural conditions. Small amounts were produced as the fungus began active growth, production rising to a maximum shortly before or simultaneously with maximum mycelial growth, and subsequently falling. The addition of vitamins to the basal medium was not required. Shaking caused variable production.

Münster (J.) & Mayor (G.). **La lutte préventive contre les viroses de la Pomme de terre.** [The preventive control of viroses of Potato.]—*Rev. rom. Agric.*, 9, 1, pp. 1–3, 1 graph, 1953.

During 1951 a preliminary experiment was carried out in four localities in Switzerland, in which seed potatoes were grown in plots at different distances from sources of infection by leaf roll and virus Y [cf. *R.A.M.*, 32, p. 444 and next abstract]. The results indicated that in areas where the insect vectors do not appear until several weeks after the plants have emerged, the selection plots should be at least 6 m. distant from any other potato crop acting as a 'pathogenic source', i.e., having about 20 per cent. or more plants affected with virus disease. In areas where the insects appear as the plants emerge isolation does not suffice to protect the crop from virus attack.

Münster (J.). **La valeur de la plantation tardive des Pommes de terre pour la production du plant. (Première communication.)** [The value of late planting of Potatoes for 'seed' production. (First communication.)]—*Rev. rom. Agric.*, 10, 10, pp. 79–81, 1 fig., 1954.

Experiments carried out by the Swiss Federal Agricultural Experiment Station from 1952 to 1954 at Chalet des Enfants, Beau-Cèdre, and Changins have shown that planting up to the end of July does not ensure virus-free plants, whereas delay until mid-August entails risk of attacks of blight [*Phytophthora infestans*] or early frost. Late planting (19th August, 1952) reduced virus infection (both leaf roll and Y) [see preceding abstract] to a markedly superior degree at a high altitude (850 m.), where virus incidence in the progeny was 12·7 per cent. (average of 300 plants) as against up to 93 per cent. for early planting (27th May), compared with 21·3 (9th August) and 99·3 (16th May), respectively, at 510 m. In 1953 premature removal of the haulms, particularly when it was done early, was more effective than late planting on 30th July, but yields were lower.

Diminution of susceptibility with increasing plant maturity was confirmed in 1953 by the results from the three earlier planted plots (April and May, 1953). At Changins the percentage of infected progeny increased from 2·3 (parents planted on 7th April) to 16 (12th May), where the haulms had been pulled early, compared with an increase of 25·7 to 44·3 on plots left to maturity. Bintje, less susceptible to viruses than Erdgold, yielded a healthier progeny than Swiss varieties. 'Seed' from late-sown plants sprouts more slowly and gives weaker stands than that from normal cultures, and is therefore unsuitable for forcing. It is not practicable to store potatoes during the summer in ordinary cellars until planting. Cold storage (at about 3° C.) and pregermination of at least three weeks can overcome this difficulty. As soon as the shoots appear treatment with fungicides, chiefly against blight, is necessary.

Silberschmidt (K.). **Potato viruses in the Americas.**—*Phytopathology*, 44, 8, pp. 415–420, 1954.

This useful survey of the geographical distribution of potato culture and the development of virus research in the Americas (especially Central and South),

presented at the Symposium on Agricultural Research in the Western Hemisphere at Madison, Wisconsin, on 9th September, 1953, is based on 76 contributions to the literature. Mention of most of the investigations referred to has been made from time to time in this *Review*.

Toxopeus (H. J.). **Leaf testing as a method of genetical analysis of immunity from Phytophthora infestans in Potatoes.**—*Euphytica*, 3, 3, pp. 233–240, 2 figs., 1954. [Dutch summary.]

At the Institute of Agricultural Plant Breeding, Wageningen, Holland, a leaflet method has been developed for testing potato lines for the presence of a series of genes for resistance to *Phytophthora infestans* [*R.A.M.*, 33, p. 753; 34, pp. 102, 173]. The detached leaflets are pinned to watersoaked wooden slats fixed to a frame; strips of tinned gauze fixed between the wood and the leaflets to permit air circulation maintain the leaves in good condition for at least eight days at a temperature of about 15° C. For good germination of the swarm spores the droplets must remain on the leaves during the first 12 hours after spraying. The suspension is therefore applied at about 5 p.m. at a rather higher temperature than that maintained during the night, and each tray covered immediately with a glass plate having wet blotting paper beneath. Mycelial growth generally appears six days later; infected leaflets are discarded before fouling sets in. Two trained workers can collect, place, and spray accurately 2,000 leaflets (30 trays) in one day. The tests may be conducted from approximately 15th May to 10th July.

To obtain good sporangia whole tubers inoculated five days previously are cut lengthwise and after a further five days at 15° become covered with a dense mycelial mass with numerous sporangia. Good sporangia were also available on leaves about six days after spraying with a zoospore suspension. A good suspension was obtained by rinsing the half tubers or the leaves with glass-distilled water, the zoospores being released two to three hours after the sporangial suspension had been poured out in a thin layer in a Petri dish standing in running tap water. About 150 ml. suspension are needed for 30 trays.

The strains of *P. infestans* were purified before use by spraying them over the leaves of their specific hosts, which should be available and well-developed by the end of April. In 1954 the genotypes of about 1,000 plants were studied by testing in triplicate their resistance to one or more strains or a mixture thereof. The percentage escape of susceptible plants is very low. The accuracy of the test is thus established.

Ormel (H. A.). **De bestrijding van de Aardappelziekte (Phytophthora infestans (Mont.) de Bary).** [The control of Potato blight (*Phytophthora infestans* (Mont.) de Bary).]—*Landbouwvoorlichting*, 11, 5, pp. 210–214, 1954.

From 1950 to 1952, inclusive, zineb (at 3 to 5 kg. per ha.) was as effective as copper-containing preparations in controlling potato blight (*Phytophthora infestans*) in Holland during the early part of the season, but with the onset of critical periods later in the summer it was generally inferior. In 1953 this effect was again observed in the southern provinces, but in the northern zineb conferred better protection throughout the season; it also stimulated plant growth. In 1952 and 1953 spraying and mist-blowing [cf. *R.A.M.*, 34, p. 173] were compared, using copper oxychloride in both years, with the addition of a colloidal copper and zineb in 1953. There was no significant difference in efficiency between the two methods.

Niederhauser (J. S.), Cervantes (J.), & Servín (L.). **Late blight in Mexico and its implications.**—*Phytopathology*, 44, 8, pp. 406–408, 1954.

The results obtained to date in breeding potatoes for resistance to blight (*Phytophthora infestans*) in Mexico [*R.A.M.*, 33, p. 315] are described and further aims

of the improvement programme briefly discussed in this paper presented at the Symposium on Agricultural Research in the Western Hemisphere at Madison, Wisconsin, on 9th September, 1953.

LeBeau (F. J.) & Schieber (E.). **Late blight of Potatoes in Guatemala.**—*Plant Dis. Reptr*, 38, 9, pp. 613–615, 2 figs., 1954. [Multilithed.]

In trials of potato varieties for resistance to blight (*Phytophthora infestans*) in the highlands of Guatemala [*R.A.M.*, 32, p. 616] Cherokee, Kennebec, and Placid were highly resistant and Alpha, Gineke, Osterbrote, Profit, Sebago, and Voran moderately so under conditions of severe infection in the rainy season at Chimaltenango (6,000 ft.) in 1952 and at Quezaltenango (7,800) in 1953. The fact that varieties with the R1 gene remained free from infection shows that race 1 was not present in these areas.

Guimarães (F. F.). **Trabalhos de melhoramento em Batata americana (Solanum tuberosum, L.).** [Breeding experiments with the American Potato (*Solanum tuberosum* L.).]—*Arch. fitotéc. Urug.*, 5, 3, pp. 311–343, 22 figs., 1953. [Received November, 1954.]

A detailed account is given of experiments covering the period from 1942 to 1949 in the breeding of potatoes for resistance to viroses (principally leaf roll and [unspecified] mosaic), *Phytophthora infestans*, and *Alternaria solani* in Rio Grande do Sul, Brazil [cf. *R.A.M.*, 31, p. 511]. Together with the unfavourable climatic conditions prevailing in the State, these diseases constitute the most important limiting factor in commercial potato production.

Among other satisfactory sources of resistance to viroses were the hybrids of five crosses between *Solanum demissum* and Katahdin (which were, moreover, immune from *P. infestans*); the introductions B70–5, Casca Roxa, Chenango, Chippewa, Cortland, D.O.D–2, Fillmore, Harford, Ostbote, Sequoia, Snowdrift, Voran III–1406, and Yampa; and a number of unnamed selections produced at the Horticultural Experiment Station, Rio Grande. Besides Katahdin, Konsuragis [28, p. 80], Albarenio, Cuculus, and Earlaine, used as parents, conferred a high degree of resistance to virus diseases.

Combined immunity from *P. infestans* and resistance to viroses was shown by Chenango, Cortland, Fillmore, Harford, Madison, Snowdrift, 370–5, and D.O.D.–2, while X–194–1 (Konsuragis × Sd. 12–559) was highly resistant to both. A number of seedlings from crosses between Cuculus, Earlaine, Konsuragis, and Katahdin and various selections were immune from blight.

None of the material tested was immune from *A. solani*, the virulence of which is reported to be increasing in the State, but a highly resistant group included the introductions 265 and 641, the self-pollinated Konsuragis Sd. 42–7, A–264–3, and A–264–4, and the hybrids X–156–5 (*S. demissum* × *S. tuberosum*), X–223–1, and X–223–2. Finally, the four characteristics sought in the experiments, i.e., productivity, satisfactory reaction to viroses, immunity from blight, and resistance or a low grade of susceptibility to early blight were united in D.O.D.–2, Fillmore, X–112–4, X–156–4, X–156–5, X–257–6, and X–295–1.

Bacterial wilt (*Phytomonas* [*Pseudomonas*] *solanacearum*) [31, p. 511] is present in the mountains and major areas of potato production in the State.

2,4-D may control Potato wilt.—*Seed World*, 75, 7, p. 43, 1954.

Preliminary trials at Connecticut Agricultural Experiment Station, New Haven, indicate that promising control of *Verticillium* wilt [*V. albo-atrum*: *R.A.M.*, 33, p. 618; 34, p. 59] of potatoes can be obtained by applying 2,4-D to young potato

plants (6 to 8 in. high) early in June. The treatment is not recommended for commercial use yet.

Demel (Johanna) & Wenzl (H.). **Die Sortenanfälligkeit der Kartoffeln gegen Fadenkeimigkeit.** [The varietal susceptibility of Potatoes to spindle sprout.] —*Bodenkultur*, 7, 2, pp. 142–151, 1953. [Received January, 1955.]

Details are given of the results of observations made between 1948 and 1953 on varietal susceptibility to spindle sprout of potatoes under the arid conditions prevailing in eastern Austria, where the defect, associated with *Colletotrichum atramentarium* [see following abstracts], is of major economic importance. In general, spindle sprout chiefly affects early varieties, in which the incidence may reach 90 per cent., an exception being Oberarnbacher Frühe, which is relatively resistant. Among the late varieties, Agnes and Roswitha are liable to severe damage. Small tubers of late varieties showed a stronger tendency to spindle sprout than larger ones, but in early varieties there was no apparent connexion between size (within the diameter range of 3·5 to 7·5 cm.) and susceptibility. The occurrence of spindle sprout may be largely prevented by lifting the tubers before maturity, i.e., at the beginning of July instead of late August, and planting from the end of June to early July rather than in April or May.

Wenzl (H.). **Die Bewertung von Welkekrankheit und Fadenkeimigkeit bei der Anerkennung von Saatkartoffeln.** [The evaluation of wilt disease and spindle sprout in seed Potato certification.] *Pflanzenarzt*, 8, 1, pp. 3–4, 1955.

The latest regulations for seed potato certification in Austria (1952) permit a maximum of 10 per cent. wilt disease [*Colletotrichum atramentarium*: *R.A.M.*, 33, p. 686 and preceding and next abstracts]. In the author's opinion, this figure is much too high for the dry climate of Lower Austria, where an incidence of only 1 per cent. in the crop has been known to be followed by 4 per cent. spindle sprout [32, pp. 501, 692, and preceding abstract] in the tubers of Sieglinde and 9 per cent. in those of Allerfrüheste Gelbe, while damage to very early varieties like Primula and Frühbote is even heavier. It is suggested that the limit of infection by *C. atramentarium* in certified 'seed' and the subsequent crop should be fixed at 0·2 per cent. and the maximum amount of spindle sprout (including the tendency to form small tubers) at 0·5 to 1 per cent. The proposed limit for wilt in the original crop is 0·1 per cent. compared with 4 per cent. in the existing regulations.

Wenzl (H.). **Kälteschäden und Schwarzpunkt-Fleckenkrankheit (Colletotrichum atramentarium) der Kartoffelknollen.** [Frost damage and black dot disease (*Colletotrichum atramentarium*) of Potato tubers.] *PflSchBer.*, 14, 1–4, pp. 1–22, 11 figs., 1 graph, 1955. [English summary.]

Stored potatoes inadequately protected against frost during the severe winter of 1953–4 in Austria developed frost damage lesions of varying depth which were commonly invaded by *Colletotrichum atramentarium* [see preceding abstracts], infection increasing the depth of the injury and rotting the flesh. Sprouting of affected tubers was markedly reduced.

Bishop (R. F.), Atkinson (H. J.), & Parent (R. C.). **The effect of limestone applications on soil composition, Potato-scab development and yields of Potatoes, Barley and Clover.** *Canad. J. agric. Sci.*, 34, 6, pp. 573–581, 1 diag., 1954.

Periodic applications of ground limestone caused an increase in potato scab (*Streptomyces* [*Actinomyces*] *scabies*) [*R.A.M.*, 33, p. 623; 34, p. 174] over the period 1943–8 at the Experimental Station, Charlottetown, Prince Edward Island, where potatoes were grown in a three-year rotation with barley and clover. Infection reached 100 per cent. in two plots receiving 3,000 lb. lime per acre.

Guthrie (J. W.) & Fulton (R. W.). **Virus-like particles in Solanum tuberosum.**—*Phytopathology*, 44, 8, pp. 473–478, 4 figs., 1 graph, 1954.

Rod-like particles were found in all parts of potato plants infected by potato virus X in electron-microscopic studies [*R.A.M.*, 29, p. 474; 32, p. 537; 34, p. 171, *et passim*] at the University of Wisconsin, the material for which consisted of exudates forced from cut veins by means of water pressure on stems or petioles. In most of the 15 varieties examined the particles were much longer (775 to 4,290 μ) than in 19 other solanaceous species sampled (493 μ in *Datura meteloides* to 766 μ in *Nicotiana glutinosa*).

Particles morphologically indistinguishable from those in infected plants were detected in USDA Seedling 41956, which is immune from potato virus X, in virus-free Chippewa potato plants, and in most of the potato seedlings examined when they had reached a height of 6 to 7 in. Rod-like particles also occurred in healthy bean (*Phaseolus vulgaris*), cabbage, and *N. glutinosa* seedlings. They are believed to be normal cell components which may be involved in virus multiplication, either by conversion to an infectious state or as carriers of a second constituent which becomes infectious only in combination with the rod-like particles.

Münster (J.) & Mayor (G.). **Contribution à l'étude de la détection des maladies à virus de la Pomme de terre par indexage (tubercule-test).** [Contribution to the study of the detection of Potato virus diseases by indexing (tuber test).] —*Annu. agric. Suisse*, (68), N.S., 3, 9, pp. 937 948, 1 fig., 1954. [German, Italian, and English summaries.]

Rindite [a mixture of seven parts by volume of anhydrous ethylene chlorhydrin, three of ethylene dichloride, and one of carbon tetrachloride], used at the Federal Agricultural Experiment Stations, Lausanne, Switzerland, for the breaking of dormancy in potato tubers, also assists in the detection of viruses by the tuber-indexing method. Not only does it stimulate germination but it accelerates the appearance of virus Y symptoms. It is advisable to use medium- to large-sized tubers and the concentration of rindite should not exceed 0·8 ml. per kg., especially for the Bintje variety. The average delay in germination of 'eyes' from the 'heel' as compared with the apex of the tuber is $5\frac{1}{2}$ days.

Münster (J.) & Pelet (F.). **Le virus S et son influence sur le rendement d'une variété de Pomme de terre.** [Virus S and its influence on the yield of a Potato variety.] *Annu. agric. Suisse*, (68), N.S., 3, 9, pp. 931–936, 2 figs., 1954. [German, Italian, and English summaries.]

In two experiments conducted in 1953 under widely differing environmental conditions near Lausanne, Switzerland, infection by the 'new' virus S [cf. *R.A.M.*, 32, p. 145] reduced the yield of Bintje potatoes by 10 to 20 per cent. The application of serological tests to samples from Holland, Germany, Denmark, Poland, and France revealed the presence of the virus in Ackersegen, Bona, Bintje, Erdgold, Frühbote, Jakobi, and Voran, but not in Sabina.

Arenz (B.) & Elkar (G.). **Nachbauverhältnisse und Ertragseinfluss bei der Bukettkrankheit der Kartoffel.** [Condition of the progeny and influence on yield of Potato bouquet disease.]—*Z. PflBau*, 5 (49), 6, pp. 257–265, 4 figs., 1954.

In a pot experiment at the Bavarian Plant Breeding Institute, Weihenstephan, in 1953, a mother clone of the Maritta potato variety with very severe secondary symptoms of potato bouquet virus [*R.A.M.*, 33, p. 588] produced under identical environmental conditions both apparently healthy and heavily infected progeny. The same process was repeated in the second generation in 1954. On the other hand, the descendants of a clone that recovered during the first year gave rise only

to healthy plants. While emergence of the apparently sound plants was normal, that of the diseased was retarded by an average of 34 days. Yield reductions in infected as compared with externally healthy plants of the same mother clone ranged from 34 to 89 per cent.

In a field stand of Ackersegen 50·8 per cent. of the young plants with unmistakable symptoms of bouquet virus infection recovered during the growing period of 1954, the corresponding figures for partial recovery and total collapse being 31·1 and 18·1 per cent., respectively. However, even the plants which seemed to be completely rehabilitated yielded on an average 36·6 per cent. less than the originally healthy, while in those that failed to recover the reduction amounted to 64·5 per cent. In 60·6 per cent. of all bouquet-diseased plants the losses ranged from 31 to 80 per cent.

URITANI (I.) & MURAMATSU (K.). **Phytopathological chemistry of black-rotted Sweet Potato. Part 3. Some knowledges concerning the penetration of Ceratostomella fimbriata into the cells of Sweet Potato. Part 4. Isolation and identification of polyphenols from the injured Sweet Potato.**—*J. agric. chem. Soc. Japan*, 27, 1, pp. 24–29, 1 pl., 2 figs.; pp. 29–33, 5 graphs, 1953. [Japanese, with English summaries. Received 1955.]

Histological examination of black-rotted sweet potato tissue, attacked by *Ceratostomella* [*Ceratocystis*] *fimbriata* [*R.A.M.*, 32, p. 337; 33, p. 111, and following abstracts], at the Department of Agricultural Chemistry, Tokyo University, Japan, indicated that the metabolic products of the pathogen were not poisonous to the host tissues; the fungus penetrated into the cells by secreting cellulase and pectinase. Melanin-like substances produced by the oxidation of polyphenols in the injured cells adhered to the mycelium, and this, in addition to the formation of a protective lignin layer, inhibited further penetration.

A phenolic compound extracted from the rotted tissue by the counter-current distribution method (Rudkin and Nelson, *J. Amer. chem. Soc.*, 69, p. 1470, 1947) was shown to be chlorogenic acid.

URITANI (I.). **Phytopathological chemistry of the black-rotted Sweet Potato. Part 5. Physiology of the polyphenols in injured Sweet Potato. Part 7. Isolation and identification of polyphenols from the injured Sweet Potato.**—*J. agric. chem. Soc. Japan*, 27, 2, pp. 57–62, 1 fig., 4 graphs; 4, pp. 165–168, 1 graph, 1953. [Japanese, with English summaries. Received 1955.]

A phenolic compound extracted from rotten sweet potato tissue [see preceding and following abstracts] was found to have very little antibiotic activity against a culture of *Ceratostomella* [*Ceratocystis*] *fimbriata*. The depth of penetration of the fungus into the tissue of three sweet potato varieties, Norin No. 1, Norin No. 5, and Okinawa No. 100, was not correlated with the production of polyphenols, so it is concluded that apart from the possible mechanical blocking of cells by oxidized polymers of polyphenols, other physical and chemical factors are involved in resistance. Caffeic acid and methyl caffeate were identified in the sound tissue adjacent to that invaded by the pathogen.

URITANI (I.) & HOSHIYA (I.). **Phytopathological chemistry of the black-rotted Sweet Potato. Part 6. Isolation of coumarin substances from Sweet Potato and their physiology.**—*J. agric. chem. Soc. Japan*, 27, 4, pp. 161–164, 1 fig., 1953. [Japanese, with English summary. Received 1955.]

In further studies on the rotting of sweet potato by *Ceratostomella* [*Ceratocystis*] *fimbriata* [see preceding and following abstracts] it was shown that sound tissue in affected tubers fluoresces blue under ultra-violet light because of the presence of

coumarins (umbelliferon, scopoletin, and possibly also esculetin), all of which inhibit the growth of the pathogen at concentrations between 1 in 1,000 and 1 in 4,000, and may possibly contribute towards host resistance.

URITANI (I.) & TAKITA (S.). **Studies on the phytopathological chemistry of black-rotted Sweet Potato. Part 8. Abnormal increase of the respiration of the injured Sweet Potato.**—*J. agric. chem. Soc. Japan*, 27, 4, pp. 168–174, 3 graphs, 1953. [Japanese, with English summary. Received 1955.]

During this series of studies [see preceding and following abstracts] it was found that the respiration of sweet potato tissue infected by *Ceratostomella* [*Ceratocystis*] *fimbriata* was two to three times greater than that of healthy. The variety Okinawa No. 100 did not form wound tissue at the damaged surface so rapidly as Norin No. 1. The respiratory quotient of sound tissue was 1 while that of *C. fimbriata* in culture was 1·1 to 1·2.

URITANI (I.), AKAZAWA (T.), & URITANI (M.). **Increase of respiratory-rate in Sweet Potato tissue infected with black rot.**—*Nature, Lond.*, 174, 4440, p. 1060, 1954.

The results of studies at the Nagoya University, Japan, indicated that the metabolite ipomeamarone, in addition to being concerned in the abnormally increased respiration of sweet potato tissue infected by *Ceratostomella* [*Ceratocystis*] *fimbriata* [see preceding and following abstracts], also exerts a protective action against the fungus by inhibiting spore germination and growth. Higher adenosine triphosphatase activity in the affected as against the sound tissue appeared to be a factor in the occurrence of oxidation uncoupled to phosphorylation.

URITANI (I.) & IECHIKA (K.). **Phytopathological chemistry of black-rotten Sweet Potato. Part 9. Some knowledges concerning ascorbic acid in the rotten Sweet Potato.**—*J. agric. chem. Soc. Japan*, 27, 10, pp. 688–692, 1 graph, 1953. [Japanese, with English summary. Received 1955.]

A further contribution to this series [see preceding and following abstracts] from the Nagoya University, Anjo, and Ochanomizu University, Tokyo, Japan, states that the concentration of ascorbic acid was higher in the healthy tissue of sweet potato adjacent to that rotted by *Ceratostomella* [*Ceratocystis*] *fimbriata* [loc. cit.] than in healthy controls. The fungus mycelium contains only a trace of the acid. The quinones produced by oxidation of the polyphenols formed in the sweet potato tissue were shown to be reduced by the ascorbic acid.

URITANI (I.). **Phytopathological chemistry of black-rotten Sweet Potato. Part 10. The mechanism for greening occurred on the sound part next to the injured, when dipped in sodium bicarbonate solution (1).**—*J. agric. chem. Soc. Japan*, 27, 11, pp. 781–785, 1953. [Japanese, with English summary. Received 1955.]

In further investigations at Nagoya University, Japan, on black rot of sweet potato [*Ceratocystis fimbriata*: see preceding and following abstracts] it was found that the cortex and xylem vessels of sound tubers and the sound part adjacent to the rotted turned green in the air after being dipped in a sodium bicarbonate solution, owing to the presence of caffeic acid esters, including chlorogenic acid. It is concluded that this coloration is due to the oxidation of accumulated polyphenols and an increase in polyphenol oxidase activity in these tissues in the presence of ammonia, amino acids, or peptides.

URITANI (I.), HOSHIYA (I.), & TAKITA (S.). **Phytopathological chemistry of black-rotten Sweet Potato. Part 11. The mechanism for greening occurred on the sound part next to the injured when dipped in sodium bicarbonate solution (2).** —*J. agric. chem. Soc. Japan*, 27, 11, pp. 785–789, 1953. [Japanese, with English summary. Received 1955.]

The results are tabulated of the colour reactions given by 33 natural and synthetic polyphenols, including those from sweet potatoes with black rot [*Ceratocystis fimbriata*: see preceding and following abstracts], oxidized by polyphenol oxidase and Purpureo salt under slightly alkaline conditions. Those turning green have a side chain of three (or a higher odd number) carbon atoms at the *p*-position of the phenol ring, and include the caffeic acid esters.

URITANI (I.) & AKAZAWA (T.). **Phytopathological chemistry of black-rotten Sweet Potato. Part 12. Activation of the respiratory enzyme systems of the rotten Sweet Potato.**—*J. agric. chem. Soc. Japan*, 27, 11, pp. 789–795, 4 graphs, 1953. [Japanese, with English summary. Received 1955.]

In a further contribution to this series from Nagoya University, Japan, it was shown that the increase in respiration of sweet potato infected by *Ceratostomella* [*Ceratocystis*] *fimbriata* [see preceding and following abstracts] was due to both the polyphenol oxidase and the cytochrome oxidase systems activated by the pathogen, and that these enzymes were inactivated by the oxidation of the polyphenols accumulated in diseased tissue. This is put forward as an explanation of the resistance to fungal penetration, since the polyphenols inhibit the respiratory enzymes of the pathogen.

AKAZAWA (T.) & URITANI (I.). **Phytopathological chemistry of black-rotten Sweet Potato. Part 13. Respiration and terminal oxidase of Ceratostomella fimbriata.** —*J. agric. chem. Soc. Japan*, 28, 3, pp. 205–212, 8 graphs, 1954. [Japanese, with English summary.]

In studies on the cytochrome oxidase system of *Ceratostomella* [*Ceratocystis*] *fimbriata* in relation to black rot of sweet potatoes at the Nagoya University, Japan [see preceding and next abstracts], hydroquinone and other substances were oxidized by laccase in the mycelial extract. Cytochrome oxidase activity was virtually localized in the insoluble particles sedimented by supercentrifugation, whereas laccase was present in the supernatant fluid. The activity of the former enzyme was greater at an early stage of culture, while the latter gradually became active with the development of a dark brown colour in the mycelium. Spore respiration was strongly inhibited by ipomeamarone [loc. cit.].

ROKUSHO (B.) & NAGASHIMA (Z.). **Studies on the acetone-butanol fermentation. Part 17. Influence of ipomoeamarone (a bitter substance found in black-rotten Sweet Potato) on the fermentation. Part 18. Fermentation tests of Sweet Potatoes which were rotted by microbes.**—*J. agric. chem. Soc. Japan*, 27, 8, pp. 503–508, 1953. [Japanese, with English summary. Received 1955.]

At the Department of Agricultural Chemistry, Schizuoka University, Japan, it was demonstrated that the addition of ipomeamarone in quantities greater than 80 mgm. per 100 ml. to dried sweet potato and soy-bean cake reduced the yield of acetone. Some other enzyme reactions were also inhibited by ipomeamarone, as was the germination of [unspecified] bacterial spores (at 20 mgm. per 100 ml. of 5 per cent. corn mash).

Further experiments revealed that the fermentation of sweet potato artificially rotted by *Ceratostomella* [*Ceratocystis*] *fimbriata* [see preceding abstracts] was difficult, yielding only 7 per cent. of the acetone obtained from sound material.

Martin (W. J.). **Varietal reaction to Ceratostomella fimbriata in Sweet Potato.**—*Phytopathology*, 44, 7, pp. 383–384, 1 fig., 1954.

Two isolates of *Ceratostomella* [*Ceratocystis*] *fimbriata* were used in inoculation experiments on sweet potato roots in Louisiana to verify Cheo's conclusions as to varietal resistance [*R.A.M.*, 32, p. 694], 'A' being obtained from a root of Unit 1 Porto Rico grown locally and 'B' from Cheo at the Plant Industry Station, Beltsville, Maryland. At 21° C. the differences in lesion diameter three weeks after inoculation between three highly resistant varieties tested were insignificant with either isolate, but at 25° to 30° they were considerable with isolate B, mean lesion diameter ranging from 11·5 in Allgold [34, p. 103] to 40·75 in Unit 1. In further tests with six highly resistant varieties isolate B caused significant differences at 21°, with a range in lesion size from 12·75 mm. in Sunnyside to 27 in Unit 1. At 23° to 28° the range for isolate A was from 13·5 mm. on B–6097 to 25·25 on B–5941, and for isolate B 13·75 on Sunnyside to 28·75 on Unit 1. Evidently, therefore, the reaction of a sweet potato variety or seedling to black rot depends on both the specific race of the fungus and the prevailing temperature. Seedling B-6097 was reasonably tolerant of the disease under the experimental conditions, with a maximum lesion diameter of 14 mm.

Webb (R. E.). **Morning-Glory, an indicator plant for the feathery mottle virus of Sweet Potato.**—Abs. in *Phytopathology*, 44, 7, p. 390, 1954.

Of several varieties of *Ipomoea purpurea* mechanically inoculated with the sweet potato feathery mottle virus [at the Louisiana Agricultural Experiment Station: *R.A.M.*, 34, p. 175], Crimson Rambler was the most susceptible and developed the most distinctive symptoms. Small, chlorotic spots appeared on the leaves 14 to 18 days after inoculation and were closely followed by slight vein-clearing and severe necrosis of many lateral veins, usually extending a short distance into the parenchyma. With advancing age the necrotic tissue cracked and portions fell out, imparting a tattered aspect to the leaf and sometimes culminating in abscission. Systemic symptoms, similar to the foregoing, began to appear when the leaves were one-eighth to one-half grown. Sap from infected *I. purpurea* and sweet potato plants induced characteristic feathery mottle symptoms on mechanically inoculated Porto Rico sweet potato plants. Comparable results followed several transfers of the virus from plant to plant of Crimson Rambler. Healthy scions of Crimson Rambler cleft-grafted to infected plants of the same variety and sweet potato also contracted the disease.

Curtis (P. J.) & Cross (B. E.). **Gibberellic acid, a new metabolite from the culture filtrates of Gibberella fujikuroi.**—*Chem. & Ind.* (*Rev.*), [31], p. 1066, 1954.

At the Butterwick Research Laboratories of Imperial Chemical Industries Ltd., a new compound, gibberellic acid, has been isolated from cultures of *Gibberella fujikuroi* [see following abstracts]. It has similar biological properties to gibberellin [*R.A.M.*, 19, p. 726; 20, p. 491] but is chemically and physically distinct, as shown by comparisons of infra-red spectra, X-ray powder photographs, and the values of certain physical constants.

Tamari (K.) & Kaji (J.). **Studies on the mechanism of injurious action of 2-methylpyridine-4-carboxylic acid on plant growth. Part 1. The comparison of respiration hindering action of 2-methylpyridine-4-carboxylic acid on Rice seedling with that of fusarinic acid. Part 2. The comparison of injurious effect of 2-methylpyridine-4-carboxylic acid on the formation of catalase and peroxidase in Rice seedling with that of fusarinic acid. Part 3. Studies on the elimination of injurious action of 2-methylpyridine-4-carboxylic acid on plant**

growth by addition of metal-ion. Part 6. Studies on the mechanism of injurious action of fusarinic acid on plant growth, a metabolic product of the causative mould of 'bakanae' disease of Rice plant. Studies on the measuring of chelation intensity of fusarinic acid and its analogous chelation substances with Cu″ or Fe‴ by polarographic method. Part 7. Studies on the elimination of injurious action of fusarinic acid on plant-growth by addition of heavy metal-ion. Part 8. Studies on the mechanism of injurious action of fusarinic acid on crystalline catalase.—*J. agric. chem. Soc. Japan*, 27, 3, pp. 144–147, 147–150; 4, pp. 159–161, 1 fig.; 5, pp. 245–249, 3 diags., 249–252, 2 figs.; 6, pp. 302–306, 2 figs., 1 graph, 1953. [Japanese, with English summaries. Received 1955.]

Investigations were made at the Faculty of Agriculture, Niigata University, Japan, on the effects of fusarinic acid (extracted from *Gibberella fujikuroi*, the cause of rice 'bakanae' disease [*R.A.M.*, 31, p. 575; 33, p. 112, and preceding and following abstracts]) and 2-methylpyridine-4-carboxylic acid on the growth of rice seedlings. It was found that both had identical reactions on the respiratory mechanism, presumably due to chelation of heavy metal ions, the latter acid being further shown to inhibit the formation of catalase and peroxidase in rice seedlings, an action prevented by the esterification of the carboxyl group, in the same way as with fusarinic acid. The injurious action of 2-methylpyridine-4-carboxylic acid on rice seedlings was completely prevented by the addition of iron and small amounts of copper, manganese, and calcium ions. Fusarinic acid possessed a stronger chelating power and was correspondingly more injurious to rice growth than 2-methylpyridine-4-carboxylic acid, which in turn was more injurious than nicotinic acid or the ethyl ester of fusarinic acid. The concentration of iron ions in the test plants decreased with an increase in concentration of the chelating agent.

Further studies revealed that the injurious effect of fusarinic acid on rice seedlings was partially eliminated by the addition of an equivalent concentration of iron or copper, and almost entirely by iron plus small amounts of copper, magnesium, and manganese.

The effects of fusarinic acid, α-picolinic acid [see below, p. 252], and 2-methylpyridine-4-carboxylic acid on catalase were in the same order as the intensity of chelation, and it is concluded that fusarinic acid combines with the iron porphyrin in the catalase molecule.

Kitamura (H.), Kawarada (A.), Seta (Y.), Takahashi (N.), Ōtsuki (T.), & Sumiki (Y.). **The biochemistry of bakanae fungus. Part 27. The production of gibberellin by submerged culture. (3).** *J. agric. chem. Soc. Japan*, 27, 8, pp. 545–549, 7 graphs, 1953. [Japanese, with English summary. Received 1955.]

Two strains of *Gibberella fujikuroi* were selected from among 20 for the production of gibberellin [see preceding and following abstracts] in submerged culture at the Department of Agricultural Chemistry, Tokyo University, Japan.

Hayashi (T.), Takijima (Y.), & Murakami (Y.). **The biochemistry of bakanae fungus. Part 28. The physiological action of gibberellin. IV.**—*J. agric. chem. Soc. Japan*, 27, 10, pp. 672–675, 1953. [Japanese, with English summary. Received 1955.]

In further studies in this series crude gibberellin [from *Gibberella fujikuroi*: see preceding and following abstracts] applied to young rice seedlings in water culture at the National Institute of Agricultural Sciences, Japan, soon caused the young leaves to elongate [*R.A.M.*, 30, p. 342] and the sucrose and starch contents to decrease, while those of hemicellulose and cellulose increased. Cells in the leaf increased in length but decreased in width. Gibberellin depressed tillering and grain production but increased straw production.

Hayashi (T.) & Murakami (Y.). **The biochemistry of bakanae fungus. Part 29. The physiological action of gibberellin. V. The effect of gibberellin on the straight growth of etiolated pea epicotyl sections.**—*J. agric. chem. Soc. Japan*, 27, 10, pp. 675–680, 1 fig., 4 graphs, 1953. [Japanese, with English summary. Received 1955.]

Further studies in this series [cf. preceding abstracts] suggested that the stimulating effect of gibberellin [from *Gibberella fujikuroi*: loc. cit. and next abstract] on pea seedlings is due to water absorption, and at suitable concentrations its effect is comparable with that of indole acetic acid at lower concentrations. Tryptophane stimulated the action of gibberellin, and L-hydroxyproline, DL-methionine, DL-proline, and nicotamide depressed it.

Stoll (C.). **Über Stoffwechsel und biologisch wirksame Stoffe von Gibberella fujikuroi (Saw.) Woll., dem Erreger der Bakanaekrankheit.** [On the metabolism and biologically active substances of *Gibberella fujikuroi* (Saw.) Woll., the cause of 'bakanae' disease.]—*Phytopath. Z.*, 22, 3, pp. 233–274, 4 figs., 15 graphs, 1954.

At the Federal Technical Institute, Zürich, Switzerland, the inoculation of Rinaldo Bersani rice plants with *Gibberella fujikuroi*, using mostly an isolate from Japan [*R.A.M.*, 20, p. 594 and preceding abstracts] and one supplied by the Centraalbureau voor Schimmelcultures, Baarn, resulted in the development of typical 'bakanae' [elongation] symptoms. The optimum temperature for the growth of the fungus on Richards's agar lay between 24° and 30° C., with a drastic reduction from 33° to 37°, while in Richards's solution production of the toxins fusarinic acid [34, p. 112], dehydrofusarinic acid, and vasinfuscarin [33, p. 453] was highest at 33°. The first two toxins are considered to be identical. On cut tomato shoots dehydrofusarinic acid induces chlorosis of the leaf blades, marginal necrosis, and shrivelling of the stem. The pH level of the culture solution fell until the third day, when it was 4·7 at 27° and 33°, and then rose steadily, reaching 8·6 and 8·9 at the same two temperatures on the 42nd day. The addition of cellulose (cotton wool extract) to Czapek's solution containing 4 per cent. glucose caused a marked stimulation of growth in both stationary and shake cultures. In the former the fungus continues to grow after the glucose supply is exhausted, but in the latter it is unable to do so. The application of gibberellin [see preceding abstracts] to rice plants in dilutions of 1 in 10, 1 in 100, and 1 in 1,000 (of which the last-named was the most active) resulted in a 20 per cent. increment in longitudinal growth.

Cherewick (W. J.). **Studies on seed-borne microflora and the effect of seed treatment of Rice.**—*Malay. agric. J.*, 37, 3, pp. 169–172, 1 fig., 1954.

Laboratory experiments in Malaya with rice seed of ten varieties obtained originally from Telok Chengai Padi Experiment Station, Kedah, revealed an average of 55·3 per cent. contamination by various fungi, a little less than one third of which was surface-borne infection. The most important diseases of rice in 1953–4 were due to *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: *R.A.M.*, 33, p. 141], *Nigrospora* [*oryzae*: 27, p. 464], and *Cercospora oryzae* [32, p. 119; 34, p. 176].

In pot experiments and one field trial at Pulau Gadong Experiment Station, Malacca, seed sterilization with agrosan GN (1·5 oz. per bush.) resulted in higher germination and good control of seed-borne diseases at a cost of less than 10 cents per bush.

Tamari (K.) & Kaji (J.). **On the biochemical studies of the blast mould (Piricularia oryzae Cavara), the causative mould of the blast disease of the Rice plant. Part 1. Studies on the toxins produced by blast mould.**—*J. agric. chem.*

Soc. Japan, 28, 3, pp. 254–258, 6 figs., 2 graphs, 1954. [Japanese, with English summary.]

At the Faculty of Agriculture, Niigata University, Japan, two crystalline substances toxic to the growth of rice plants were isolated from liquid cultures of the rice blast fungus, *Piricularia oryzae* [*R.A.M.*, 33, p. 112; 34, p. 105]. They were α-picolinic acid [see above, p. 250] and a substance with higher toxicity, named by the authors piricularin. Paper chromatography revealed the presence of both these compounds in rice plants attacked by *P. oryzae*. Varietal reaction to the fungus was not correlated with resistance to these toxins.

Hastings de Gutiérrez (Lucy). **Presence of Piricularia oryzae on Sugar Cane in Costa Rica.**—*Plant Dis. Reptr*, 38, 9, p. 695, 1955. [Multilithed.]

Piricularia oryzae was observed in 1951 and again in 1953 in sugar-cane fields at Turrialba, Costa Rica. The fungus had apparently spread to adjacent rice plantings [*R.A.M.*, 31, p. 372], which were heavily diseased, there being no evidence of seed-borne infection.

Gupta (S. P.). **Some observations on an obscure disease of Paddy (yellowing).**—*Sci. & Cult.*, 20, 5, pp. 247–248, 1954.

Yellowing disease of rice [cf. *R.A.M.*, 27, p. 9] apparently not due to a pathogen or a deficiency was studied in various districts of Calcutta State from 1952 to 1954. It was observed to be at its worst during the tillering stage and just before flowering when the oxygen requirement of the crop is high. Affected patches do not appear to spread and the diseased areas are not repeated in the same place or in successive years. Reduction products were detected in the root zone. Phosphate applications and field drainage gave some control but did not cure the disorder.

Allerton (F. W.). **Trace element deficiencies.**—*Gdnrs' Chron.*, Ser. 3, 137, 3547, pp. 4–5, 1955.

The author describes the action of sequestrene (Geigy Co., Ltd., Manchester) in eliminating trace element deficiencies in plants, particularly ornamental pot plants [*R.A.M.*, 32, p. 626], and gives tentative recommendations for the use of sequestrene iron, manganese, magnesium, copper, and zinc for the treatment of plants and crops deficient in these elements, for those wishing to experiment on curative methods.

Stalé (J.) & Bovay (E.). **La carence de manganèse chez les végétaux. I. Ses manifestations et les conditions dans lesquelles on l'observe. II. Résultats d'expériences. Les moyens propres à lui porter remède.** [Manganese deficiency in plants. I. Symptoms and the conditions in which it is observed. II. Results of experiments. Correct methods of control.]—*Rev. rom. Agric.*, 10, 11, pp. 85–87, 4 figs.; 12, pp. 93–95, 2 figs., 1954.

In the first article the authors review the symptoms of manganese deficiency on various hosts.

In pot tests carried out at the Swiss Federal Agricultural Experiment Stations, Lausanne, to find a remedy for manganese deficiency [*R.A.M.*, 31, p. 387] in peat soils with high calcium content, two spray applications of a 1 per cent. solution of manganese sulphate during the growing period had a marked effect on the oat variety Flaemingsgold, improving the proportion of grain to straw and the weight and quality of the grain. Field tests in the neighbourhood of Bavois (Plaine de l'Orbe) in 1952 on Huron wheat in comparable soil gave similar results.

In 1953 in the same area three treatments with a 0·2 per cent. solution (6 kg. pure substance per ha.) on the potato variety Ackersegen more than doubled the

total tuber yield and decreased the proportion of small tubers. Two treatments with a 0·2 per cent. solution, provided they were applied as soon as the plants emerged from the ground, doubled the dry fodder yield of purple clover in pot tests and retained their effect on the second crop, so that a repetition of the treatment was rarely necessary.

Since manganese deficiency is due more to the presence of active calcium, which renders manganese insoluble, addition of manganese in a solid form (basic slag) is useless. So is the immersion of seed in a manganese sulphate solution, or the surface treatment of the soil immediately after sowing. The concentration of the solution to be used in spray treatments depends on the nature of the foliage. Plants with tough leaves, e.g., cereals, can tolerate a 4 per cent. solution, beet a 3 per cent., while for sensitive leaves, such as potato, the solution should not be stronger than 0·5 per cent.

Viets (F. G.), Boawn (L. C.), & Crawford (C. L.). **Zinc contents and deficiency symptoms of 26 crops grown on a zinc-deficient soil.**—*Soil Sci.*, 78, 4, pp. 305–316, 6 figs., 1954.

In 1952, 26 crops were grown with and without the addition of zinc fertilizers on two adjacent areas in central Washington State, one of which had produced severe zinc deficiency symptoms in maize during the previous year. The crops developing zinc deficiency symptoms were *Ricinus communis*, Red Mexican beans (*Phaseolus vulgaris*) [cf. *R.A.M.*, 33, p. 651], *P. lunatus*, maize (Golden Cross sweet corn and Iowa 939 hybrid field), Sudan grass, Concord vine, hops, soy-bean, flax, and tomato. The symptoms were similar on both areas. Soil amendments of 23 lb. zinc sulphate per acre reduced the severity of the symptoms or prevented their development entirely.

Datta (N. P.). **Micronutrient deficiencies in crops in relation to some Indian soils.**—*Bull. nat. Inst. Sci. India* 3 (Proceedings of the Symposium on Soil Research in India, Calcutta, January, 1952), pp. 200–206, 1954.

The information in this paper on top yellowing of gram [*Cicer arietinum*] and mottling or frenching in citrus has already been noticed briefly from another source [*R.A.M.*, 31, p. 541]. The former disorder is believed to be due to an air-water disequilibrium in the root zone.

Joshi (N. V.). **Investigations on microbiology of soils.**—*Bull. nat. Inst. Sci. India* 3 (Proceedings of the Symposium on Soil Research in India, Calcutta, January, 1952), pp. 115–121, 1954.

This general discussion of the microbiology of Indian soils with particular reference to the role of nitrogen-fixing bacteria includes a section on the partial sterilization (or 'rabbing') of soil by burning cattle dung cakes and dried twigs and branches on a piece of land before it is sown with rice seeds. This appears to alter the physical condition of the soil and results in higher yields.

Biswas (T. D.). **Contents of different forms of manganese in important soil groups of India.**—*Bull. nat. Inst. Sci. India* 3 (Proceedings of the Symposium on Soil Research in India, Calcutta, January, 1952), pp. 193–199, 1954.

Data are presented on the distribution and content of the different forms of manganese in the various soil types of India [*R.A.M.*, 31, p. 514], viz., black and alluvial, red loam, laterites, calcareous, and soils on mountain tracts.

Kobo (K.) & Takai (Y.). **Microbiological studies on the humification process. Part 1. Effect of microbes on the transformation of soil humus. Parts 2 and 3. On the aerobic decomposition of the fresh plant residue (a). Absorption spectra**

of decomposition products (b).—*J. agric. chem. Soc. Japan*, 27, 7, pp. 445–448; 8, pp. 477–485, 8 graphs, 1953. [Japanese, with English summaries. Received 1955.]

At the Department of Agricultural Chemistry, Tokyo University, Japan, under experimental conditions *Trichoderma koningi* [*T. viride*: *R.A.M.*, 32, pp. 582, 643] and soil extract promoted humification in a soil sample.

T. viride and *Aspergillus niger* were very active in the humification of fresh upland rice straw. *Bacillus mycoides* was second to *T. viride* in humus formation, though *Actinomyces chromogenes* [26, p. 513] liberated more carbon dioxide. It is concluded that *T. viride* is superior to aerobic bacteria in producing humus in the soil, though not in the early stages of the process.

Further work with rice straw and chestnut leaves supported the view that *B. mycoides* was superior to *T. viride* in increasing humification in the early stages of incubation. Humification was greater in soil following a mixed inoculation with *T. viride* and *B. mycoides* than with either organism singly.

Kox (Elisabeth). **Der durch Pilze und aerobe Bakterien veranlasste Pectin- und Cellulose-Abbau im Hochmoor unter besonderer Berücksichtigung des Sphagnum-Abbaus.** [Pectin and cellulose decomposition on high moorland caused by fungi and aerobic bacteria, with special reference to sphagnum decomposition.]—*Arch. Mikrobiol.*, 20, 2, pp. 111–140, 4 figs., 1 graph, 1954.

Of 20 fungi isolated from a high moorland soil in Germany, comprising 15 symbionts from roots of Ericaceae belonging to *Cladosporium* or related genera, two species of *Mortierella*, one of *Penicillium*, and two of *Verticillium*, most of the symbionts, *P.* sp., and *V.* spp. were capable of decomposing cellulose, both in the pure state and in the form of blotting paper, as well as pectin; the *M.* spp. were totally inactive. Only one of the symbionts caused intensive decomposition of the pectin-cellulose membranes of *Sphagnum* stems, while a few other members of the same group induced slight changes; all the remaining organisms were without effect.

Rinaldi (A.). **Uromyces glycyrrhizae (Raben.) P. Magnus.**—*Nuovo G. bot. ital.*, N.S., 60 (*1953*), 4, p. 943, 1954. [Received 1955.]

In this summary of a paper read at a meeting of the Società Botanica Italiana on 21st December, 1953, it is stated that *Uromyces glycyrrhizae* [cf. *R.A.M.*, 27, p. 114] was found in September, 1952, on *Glycyrrhiza* (?) *glabra* growing along the Cosenza–Metaponto railway, Italy.

Joshi (N. C.). **Rotting of Castor seeds by Cephalosporium curtipes Sacc.**—*Sci. & Cult.*, 20, 5, pp. 248–249, 1 fig., 1954.

Cephalosporium curtipes was found to be responsible for rotting of castor oil [*Ricinus communis*] seeds kept in the mycology laboratory, Government College, Ajmer, India. In pathogenicity experiments the fungus readily infected healthy seeds. Similarly, healthy seeds kept with the diseased ones became infected.

Iyengar (A. V. V.). **The physiology of the spike disease of Sandal.**—*Bull. nat. Inst. Sci. India* 3 (Proceedings of the Symposium on Soil Research in India, Calcutta, January, 1952), pp. 231–232, 1954.

A study of nutrient absorption by sandal trees affected by spike in India [*R.A.M.*, 27, p. 585] revealed that the roots contain high quantities of lime and are low in nitrogen. Similar abnormalities occur when the plant is predisposed to infection in the field. These features and the systemic nature of the disease lead to the conclusion that it may be a root disease.

NARASIMHAN (M. J.). **Studies on the spike disease of Sandal Santalum album Linn.** —*Indian For.*, 80, 11, pp. 690–691, 1954.

The author has established the infectious nature of spike disease of sandal in India [cf. preceding abstract] by grafting an infected twig on to a healthy tree; the latter was infected entirely in six months. Various other methods of inoculation including sap rubbing were unsuccessful. Cytological investigations revealed that starch grains were large and abundant in the pith and medullary rays of the stems and petioles but minute in the chloroplasts of diseased leaves; phloem necrosis was marked by sieve-tube collapse; chloroplast degeneration was marked, particularly in an advanced stage of spike; cell inclusions adpressed to the nucleus were present in almost every cell and reacted to staining. From these results the virus nature of spike appears undeniable.

PEMBERTON (C. E.). **Sugar-Cane quarantine in Hawaii.**—*Sug. J., N. Orleans*, 17, 2, pp. 12, 14, 1954.

A detailed description is given of the disinfecting and quarantine treatments, which have been used in Hawaii for many years, for imported sugar-cane cuttings and seed to prevent the introduction and establishment of [unspecified] diseases or pests not present in the country. Written permits must be obtained in advance from both the Federal and Territorial administrations for the importation of canes from foreign countries. Upon receipt the canes are handled by the Quarantine Committee consisting of the Director of the Experiment Station of the Hawaiian Sugar Planters' Association and certain members of his staff. A quarantine house has been erected in an isolated part of the Island of Molokai where sugar-cane is not grown. It consists of a large house for propagating from seed and a small one for the treatment and growing of imported cuttings. In the vestibule, clothes are kept for inspectors and other workers, disinfectants are stored, and a shower bath provided. Persons must change their clothes and shoes before passing on to the quarantine units, and the special clothes used in the units must be left in the vestibule after use; they are periodically sterilized. A mat saturated with disinfectant is provided at the entrance to the building. A feature of the quarantine house is a tightly closed dark room through which one must pass to enter the small unit. The hands must be thoroughly disinfected on entering or leaving the building.

All incoming canes are given a hot-water dip of 20 minutes at 52° C. They are grown in the small unit for three to six months, cuttings are taken from them, treated with hot water, and planted in fresh pots, and the original material destroyed. After a year cuttings are taken from these if no pest or disease has developed, treated with hot water and planted in a quarantine field at least 1,000 ft. from the quarantine house. After another year, if no pest or disease appears cuttings are released for planting on other islands.

The fuzz is disinfected with hot mercuric chloride solution (1 in 5,000) at 50° for 20 minutes, and after cooling in water for a few minutes is ready for planting in the quarantine house. Subsequent treatment is in line with that for cuttings.

KING (N. J.) & STEINDL (D. R. L.). **The relationship between varietal yield deterioration and ratoon stunting disease.**—*Cane Gr. quart. Bull.*, 17, 2, pp. 64–73, 5 figs., 1953.

In this paper, presented to the Eighth Congress of the International Society of Sugar-cane Technologists, the authors describe investigations on ratoon stunting virus disease in Queensland [*R.A.M.*, 34, p. 183 and following abstracts] and conclude that there is reasonable proof that the disease is responsible for deterioration in the yield of certain varieties [33, p. 51].

Steindl (D. R. L.) & Hughes (C. G.). **Ratoon stunting disease.**—*Cane Gr. quart. Bull.*, 16, 3, pp. 79–95, 11 figs., 1953.

Most of this information on the symptoms, distribution, cause, transmission, and control of sugar-cane ratoon stunting virus disease in Queensland [see preceding and next abstracts] has already been noticed in this *Review*.

Hughes (C. G.). **The Bureau Pathology Farm.**—*Cane Gr. quart. Bull.*, 17, 2, pp. 57–61, 4 figs., 1953.

In view of the changing status of sugar-cane diseases in Queensland it is urged that the policy of conducting resistance trials on commercial farms be revised. For instance, should the control of ratoon stunting virus disease [see preceding abstracts] prove successful, it would be dangerous to carry out further trials in commercial areas. A Pathology Farm, 58 acres in extent, situated at Eight Mile Plains, near Brisbane, and isolated from commercial plantings, was established at the end of 1951 by the Bureau of Sugar Experiment Stations. As well as plots for resistance trials, propagation plantings, and experimental work, the Farm maintains collections of living specimens of miscellaneous diseases, including a small plot infected by downy mildew (*Sclerospora* [*sacchari*: *R.A.M.*, 34, p. 183]).

Vallance (L. G.). **Farm built equipment. A guide to building a suitable power spray.**—*Cane Gr. quart. Bull.*, 16, 3, pp. 99–114, 5 figs., 8 diags., 1953.

Fully illustrated, detailed instructions are given for building and operating a tractor-driven power spray suitable for use in the sugar-cane growing districts of Queensland [cf. *R.A.M.*, 34, p. 183]. Most of the constructional work can be done by the grower.

Mungomery (R. W.). **The campaign against Fiji disease in the Bundaberg and Moreton areas.**—*Cane Gr. quart. Bull.*, 17, 2, pp. 50–51, 1953.

Most of the information reviewed here on the control of Fiji [virus] disease of sugar-cane in the Bundaberg and Moreton districts of Queensland [*R.A.M.*, 34, p. 183] has already been noticed. Since 1926 [27, p. 495] the disease has always remained under commercial control, and even during the peak period (about 1944–5) direct losses did not exceed 70 tons of cane in either district. Indirect effects, such as the prohibition of a susceptible but otherwise particularly good variety, were probably more serious. Eradication can be considered complete only when no diseased stools are found during several years of careful inspection. In the Bundaberg district the number of diseased stools found and rogued declined from 7,475 in 1944–5 to 14 in 1952–3 and in Moreton from 11,000 to 35. In the absence of the disease choice of new varieties will depend, not on resistance, but on their production potential for the area.

Control measures [loc. cit.; 31, p. 352] include the burning and harvesting of any diseased fields each year by 31st October, the ploughing out by 30th November of all diseased blocks after the second ratoon crop, and early and regular roguing.

Lo (T. C.), Chu (H. T.), & Chiu (J. C.). **A comparative study of the fungi of Stagonospora causing leaf scorch disease on Sugar Cane and Miscanthus spp.**—*Rep. Taiwan Sug. Exp. Sta.*, 10, pp. 105–112, 6 figs., 1953. [Chinese, with English summary.]

In a comparison of four isolates of *Stagonospora*, two from *Miscanthus sinensis* and one from the sugar-cane variety N:Co. 310 in Formosa were identical with *S. sacchari* [see next abstract], but the fourth, isolated from *M. japonica*, had slight cultural differences (a lower growth rate, denser pycnidia, less conspicuous hyphal strands) and wider temperature range, though it was similar morphologically. All

the isolates were pathogenic to sugar-cane, *M. japonica*, and *Andropogon sorghum* [*Sorghum vulgare*] and its var. *vulgaris*. The isolate from *M. japonica* produced typical leaf scorch symptoms on sugar-cane.

Van Dillewijn (C.) & Lopez (M. E.). **Leaf scorch of Sugar Cane.**—*Sug. News*, 30, 2, pp. 73–74, 2 figs., 1954.

In the Victorias mill district, northern Negros, Philippines, the standard sugar-cane variety H 37–1933 is affected by a premature desiccation of the leaves which was shown by symptomatological, histological, and mycological studies to be associated with *Stagonospora sacchari*, reported from Formosa [see preceding abstract] (also in *J. Sugar Cane Res.*, 4, pp. 323–335, 1950; *Rep. Taiwan Sug. Exp. Sta.*, 8, pp. 133–149, 1952; *J. Sugar Cane Res.*, 7, pp. 37–44, 1953.)

The initially minute, fusiform, red to dark brown spots on both leaf surfaces, surrounded by a yellowish halo, gradually extend along the vascular bundles and coalesce into spindle-shaped streaks, turning straw-coloured with a reddish-brown margin. Severe infection may destroy most of the leaf except the midrib. The globose to oval, black pycnidia, embedded in the necrotic leaf tissue, contain hyaline, elliptical to fusiform, mostly triseptate pycnidiospores, 44·6 to 51·5 by 10·3 μ. Under humid conditions occlusion of the xylem and phloem by a reddish substance may follow infection, impeding water transport and culminating in desiccation. The form of leaf scorch caused by *S. sacchari* is briefly compared with similar manifestations due to natural environmental conditions.

Abbott (E. V.), Hebert (L. P.), Schexnayder (C. A.), & Tippett (R. L.). **Sugar-Cane seedling work at the Houma Station 1953–54.**—*Sug. Bull., N. Orleans*, 32, 22, pp. 367–370, 1954.

Of 19,703 sugar-cane seedlings of the 1952 breeding season inoculated with sugar-cane mosaic virus at Houma, Louisiana, in 1953 [*R.A.M.*, 32, p. 212], 9·6 per cent. contracted the disease and were eliminated before transplanting, while a further 3·4 per cent. developed infection at a later stage. Of 41,063 potted seedlings produced in 1953 and inoculated in 1954, 9·7 per cent. became infected before transplanting.

Pinto (R. J.). **Experiencias con Caña de Azúcar en la región del Pacífico.** [Trials with Sugar Cane in the Pacific region.]—*Suelo tico*, 6, 28, pp. 146–149, 1952. [Received January, 1955.]

Tests [in Costa Rica] of sugar-cane varieties from various Stations in the Pacific region of the tropics revealed that those from the Central Station, Barbados, gave the best results. A trial of varieties from Barranca, Peru, in comparison with the mosaic-tolerant B–34104 [cf. *R.A.M.*, 32, p. 644] demonstrated tolerance of the virus by B–3761 and resistance in B–41227, B–4362, and B–42231 [33, p. 632]. Of 15 varieties tested for commercial value only B–34104 and H.A. (hybrid La Argentina) gave good results, the only Barbados varieties outclassing them being B–41227 and 37161.

Lindquist (J. C.). **Notas uredinológicas II.** [Uredinological notes II.]—*Rev. Fac. Agron. Eva Perón* (formerly *Rev. Fac. Agron., B. Aires*), Ser. 3, 29, 1, pp. 35–44, 1 fig., 1953. [English summary. Received 1954.]

This annotated list of 11 more rust fungi occurring in Argentina [cf. *R.A.M.*, 33, p. 262] includes descriptions of seven new species, among them *Aecidium dubitabile* on *Areca* sp. The rest are new host or country records; the latter include *Puccinia cynodontis* on *Cynodon dactylon*.

Wilson (M.) & Henderson (D. M.). **Notes on British Uredinales.**—*Trans. Brit. mycol. Soc.*, 37, 3, pp. 248–255, 1954.

This contribution gives additional notes on 28 British rusts which appeared in Wilson and Bisby's list [*R.A.M.*, 33, p. 757]. *Chrysomyxa rhododendri* has been found on spruce (*Picea abies* (heavily infected) and *P. sitchensis*), *Rhododendron hirsutum* [33, p. 522], *R. ponticum* (heavily infected), *R. ferrugineum* (heavily infected), and *R. roylei*. Spores from caeomata of *Melampsora tremulae* on *Mercurialis perennis* produced uredo- and teleutospore stages on aspen (*Populus tremula*). The aecidial stage of *Puccinia arrhenatheri* [cf. 32, p. 193], first found in Great Britain on *Berberis vulgaris* in 1944, is described. Teleutospores of *P. graminis* were collected on *Deschampsia caespitosa*: they are uncommon on this host. Teleutospores of *Pucciniastrum epilobii* produced aecidia on *Abies grandis*, and natural infections were found on young trees at Lauder, Scotland.

Sato (S.). **Uredinales collected in Mt. Zawô and Mt. Asahi-dake, Prefecture Yamagata.**—*J. Jap. Bot.*, 29, 8, pp. 251–256, 1954. [Japanese.]

This list of 73 rust fungi found in Japan [*R.A.M.*, 33, p. 383] includes *Uromyces nerviphilus* [*U. trifolii*: 24, p. 473] and *U. trifolii* on *Trifolium repens*, *Puccinia allii* on *Allium fistulosum*, and *P. poae-nemoralis* on *Poa pratensis*.

Kern (F. D.) & Thurston (H. W.). **Additional species of Uredinales from Colombia.**—*Mycologia*, 46, 3, pp. 354–357, 1954.

In this instalment [cf. *R.A.M.*, 20, p. 81] nine additional species of Uredinales (including three new ones) from Colombia are recorded, bringing the total to 233. Mention may be made of *Melampsora larici-populina* on *Populus nigra* var. *italica*, the collection of which agreed well with the European species [cf. 30, p. 202; 33, p. 182], *Puccinia flaccida* on *Echinochloa crus-galli*, *Uromyces striatus* on lucerne, and *U. dolicholi* on pigeon pea.

Gordon (W. L.). **The occurrence of Fusarium species in Canada III. Taxonomy of Fusarium species in the seed of vegetable, forage, and miscellaneous crops. IV. Taxonomy and prevalence of Fusarium species in the soil of cereal crops.**—*Canad. J. Bot.*, 32, 5, pp. 576–590, 622–629, 1 pl., 5 figs., 1954.

At the Plant Pathology Laboratories in Ottawa and Winnipeg the microbiological examination of seed from a total of 44 species and varieties of vegetable, forage, and miscellaneous crops yielded 16 species, varieties, and forms of *Fusarium* [cf. *R.A.M.*, 31, p. 597], classified in eight sections of the genus. *F. equiseti* was identified among isolates from 34 host species, *F. poae* and *F. oxysporum* each from 18, *F. acuminatum* 17, *F. avenaceum* 16, *F. culmorum* 10, *F. sambucinum* and *F. moniliforme* [*Gibberella fujikuroi*: 33, p. 245] each from five, *F. graminearum* [*G. zeae*: loc. cit.] and *F. sambucinum* var. *coeruleum* [*G. pulicaris* var. *minor*] each from four, *F. solani* three, *F. sporotrichioides* two, and *F. arthrosporioides*, *F. semitectum*, *F. compactum*, and *F. oxysporum* f. *lini* each from one. These results indicate that most of the *Fusarium* species commonly found in the soil or other habitats in localities where seed is produced may be encountered in seed whenever atmospheric conditions are relatively moist. However, efficient seed treatment should prevent damage to seedlings by pathogenic strains and prevent their dissemination by the seed.

Part IV is concerned with a taxonomic study made jointly at the Plant Pathology Laboratory and the Bacteriology Department, University of Manitoba, Winnipeg, of 12,485 *Fusarium* isolates, representing 16 per cent. of the total fungi obtained from 1,674 soil samples taken from two series of permanent cereal plots from 1936 to 1942. The isolates fell into eight sections of the genus as follows: *F. dimerum*

and *F. merismoides* (Eupionnotes): *F. poae* and *F. sporotrichioides* (Sporotrichiella): *F. avenaceum* (Roseum): *F. concolor* and *F. semitectum* (Arthrosporiella): *F. acuminatum* and *F. equiseti* (Gibbosum): *F. culmorum*, *F. sambucinum* and its var. *coeruleum*, and *F.s.* f. 6 [*G. cyanogena*: 33, p. 368] (Discolor): *F. oxysporum* and its var. *redolens* (Elegans): and *F. solani* (Martiella).

F. oxysporum (chiefly its var. *redolens*) accounted for about 50 per cent. of the total *Fusarium* isolates and had an average concentration of approximately 4,800 viable 'units' (conidia, chlamydospores, hyphal cells) per gm. of soil, followed by *F. equiseti* (25 per cent.) with 2,300, the other species isolated having less than 600 each. All except *F. dimerum* and *F. merismoides* have been isolated already from the basal parts and the seed of cereals in the Prairie Provinces [31, p. 597]. The species generally conceded to be of importance in cereal pathology, namely, *G. zeae*, *G. fujikuroi*, and *F. nivale* [*Calonectria nivalis*] were apparently absent from these plots. In spite of its relatively low concentration *F. culmorum* was present in each year of the study and appeared to form part of the persistent *Fusarium* flora.

Dennis (R. W. G.). **Some pleurotoid fungi from the West Indies.**—*Kew Bull., 1953*, 1, pp. 31–45, 19 figs., 1953.

In this key for the identification of some *Pleurotus* spp. [cf. *R.A.M.*, 24, p. 75] from the West Indies [cf. 31, p. 300] five new combinations and one new species are described.

Luc (M.). **Champignons graminicoles de Côte d'Ivoire. I. Pyrénomycètes.** [Graminicolous fungi of the Ivory Coast. I. Pyrenomycetes.]—*Rev. Mycol.*, 18. *Suppl. colon.* 1, pp. 1–37, 10 figs., 1953.

Full descriptions with taxonomic notes are given of eight pyrenomycetes found on graminicolous hosts in the Ivory Coast: *Melanomma glumarum* f. *africana* n.f., *Leptosphaeria culmicola* f. *minor*, and *L. oryzina* (Sacc.) emend. on rice: *L. sorghi-arundinacei* n.sp. on *Sorghum arundinaceum*: *Ophiobolus coicis* n.sp. and *Amphisphaeria coicis* n.sp. on *Coix lacryma-jobi*: and *Melanospora pampeana* and *Mycosphaerella zeicola* [*R.A.M.*, 31, p. 281] on maize.

L. sorghi-arundinacei has perithecia measuring 65 to 80 μ in diameter, asci 48 to 67 by 8 to 10 μ, and ascospores 13·7 to 18·8 by 3·4 to 4·7 μ. The perithecia of *O. coicis* are 300 to 430 μ in diameter, the asci 125 to 142 by 7·3 to 11 μ, and the ascospores 125 to 150 by 2·3 by 3·2 μ. *A. coicis* has perithecia measuring 220 to 300 by 180 to 280 μ, asci 90 to 115 by 12·5 to 15 μ, and ascospores (uniseptate) 27 to 32 (37) by 5 to 6·5 μ (triseptate 29 to 34 μ long).

Cunningham (G. H.). **Thelephoraceae of New Zealand. Part III: the genus Corticium.**—*Trans. roy. Soc. N.Z.*, 82, 2, pp. 271–327, 1 pl., 38 figs., 1954.

In further studies on the Thelephoraceae of New Zealand [*R.A.M.*, 33, p. 383] the genus *Corticium* is described, together with notes on distribution, hosts, and comparative features and a key to 42 recognized species, 21 of which are new; 20 species are excluded. The characteristic feature is an even hymenium consisting of a palisade of basidia and paraphyses developing from a context of woven or upright hyphae arising from a layer of parallel hyphae attached to the substratum. *C. fuciforme* [33, p. 429] is common throughout the North Island on culms and leaves of the grasses of pastures and turf, e.g., *Agrostis tenuis*, *Lolium multiflorum*, and *L. perenne*. It is suggested that its proper taxonomic position may be under *Clavaria*.

Henderson (D. M.). **Urocystis floccosa in Britain.**—*Notes roy. bot. Gdn Edinb.*, 21, 5, pp. 241–242, 1955.

Following the proposal to conserve *Urocystis* against *Tuburcinia* (D. P. Rogers,

Taxon, 2, 2, pp. 29–32, 1953) the new combination *U. ficariae* is proposed for the smut on *Trollius* and *Ranunculus ficaria*. Similarly *U. floccosa* n.comb. is proposed for the smut on *Helleborus*. A collection believed to be of this species was recently found in a duplicate set of C. E. Broome's exsiccati in the Edinburgh Herbarium, labelled *Ustilago* on *H. viridis*, found near Bath. It matches continental collections on *H. viridis* and *H. foetidus* but differs from *U. anemones* and *U. ficariae* in having a high proportion of three-spored spore-balls and a few four- or five-spored.

Keener (P. D.). **Cladosporium aecidiicola Thuem. and Tuberculina persicina (Ditm.) Sacc. associated with Puccinia conspicua (Arth.) Mains on Helenium hoopesii A. Gray in Arizona.**—*Plant Dis. Reptr*, 38, 9, pp. 690–694, 5 figs., 1954. [Multilithed.]

Cladosporium aecidiicola [*R.A.M.*, 19, p. 730] was recorded in 1952 in the Santa Catalina mountains, Arizona, on the leaves of *Helenium hoopesii* and in the aecidia of *Puccinia conspicua* on these leaves. The dematiaceous hyphae were frequently observed either in intimate contact with, or penetrating into, the rust spores and peridial cells. Some aecidia contained no spores or other rust elements, while conidiophores and conidia of the hyperparasite were abundant on or near to them.

Tuberculina persicina was also observed in the same sori as *C. aecidiicola*, or associated with different sori or with pycnia [24, p. 476].

Von Arx (J. A.) & Olivier (Dorothea L.). **The taxonomy of Ophiobolus graminis Sacc.**—*Trans. Brit. mycol. Soc.*, 35, 1, pp. 29–33, 1 diag., 1952.

A study in the Phytopathological Laboratory 'Willie Commelin Scholten', Baarn, Holland, of the structure of the perithecia, asci, and ascospores in *Ophiobolus graminis*, the agent of take-all and whiteheads of wheat and other cereals, indicated that it belongs to the Diaporthaceae-Gnomoniaceae and that the typical species of the genus *Ophiobolus* are members of the Pseudosphaeriales. *O. graminis* is shown to be closely related to *Linospora* and *Ophiognomonia* and most of all to *Plagiosphaera* [*R.A.M.*, 28, p. 248], from which it differs only in the globose perithecium and the angle of the neck, and in its much thicker wall. Accordingly, *Ophiobolus graminis* is designated the type of the new genus *Gaeumannomyces* [see next abstract].

Petrak (F.). **Über die Gattungen Gaeumannomyces v. Arx et Olivier, Halophiobolus Linder und Linocarpon Syd.** [On the genera *Gaeumannomyces* v. Arx & Olivier, *Halophiobolus* Linder, and *Linocarpon* Syd.]—*Sydowia*, 6, 5–6, pp. 383–388, 1952.

The type species of the genus *Linocarpon* (Clyposphaeriaceae) (*Ann. mycol., Berl.*, 15, p. 210, 1917), *L. pandani*, was originally described by Sydow under the name *Linospora pandani* (ibid., 11, p. 60, 1913), which was retained by Clements & Shear [in 'The Genera of Fungi'], p. 277, although in his second paper Sydow expressly differentiates the two genera. Linder's genus *Halophiobolus* (*Farlowia*, 1, p. 415, 1944) corresponds, at any rate in part, to *Linocarpon*. Further, *Gaeumannomyces* [see preceding abstract] is regarded as identical with *Linocarpon* and its type species, *G. graminis*, therefore becomes synonymous with *L. cariceti* (B. & Br.) n.comb., and *Ophiobolus graminis* is another synonym [cf. *R.A.M.*, 1, p. 381; 5, p. 223].

Servazzi (O.). **Pestalotia o Pestalotiopsis?** [*Pestalotia* or *Pestalotiopsis*?]—*Nuovo G. bot. ital.*, N.S., 60 (*1953*), 4, pp. 943–947, 1954. [Received 1955.]

In this paper, read at a meeting of the Società Botanica Italiana on 21st December, 1953, the author, after referring to Steyaert's erection of the genera *Pestalotiop-*

sis and *Truncatella* [*R.A.M.*, 28, p. 489] and briefly recapitulating the history of the genus *Pestalotia* [12, p. 57; cf. 31, p. 227], adduces reasons for rejecting Steyaert's proposal. In his opinion, the genus *Pestalotia* as at present defined and generally accepted could not possibly be confused with any other and therefore should not be split up. The spelling *Pestalotia* is the correct latinization of Pestalozzi and could not possibly be a misprint.

Sakaguchi (K.) & Izuka (H.). **A study on the nature of conidiophore-walls of Aspergillus oryzae and Asp. sojae.**—*J. agric. chem. Soc. Japan*, 27, 7, pp. 402–405, 2 figs., 1953. [Japanese, with English summary. Received 1955.]

Electron microscope studies at the Department of Agricultural Chemistry, Tokyo University, demonstrated that the conidiophore walls of *Aspergillus oryzae* have numerous projections 0·08 to 0·24 μ high, while those of *A. sojae* (Sakaguchi & Yamada: *J. agric. chem. Soc. Japan*, 20, p. 65, 1944) are smooth.

Iguchi (N.). **Studies on Aspergilli. Part 7. Induction of induced mutations in Aspergillus sojae by nitrogen mustard (1).**—*J. agric. chem. Soc. Japan*, 27, 5, pp. 229–233, 1953. [Japanese, with English summary. Received 1955.]

At the Noda Industrial and Scientific Research Laboratory, Japan, a study was made of the morphological mutations induced in *Aspergillus sojae* [see preceding abstract] by nitrogen mustard [cf. *R.A.M.*, 32, p. 6]. The spores were killed by an exposure to 0·01 *M* of the gas for 20 minutes; at lower concentrations germination was retarded and a mutation rate of about 30 per cent. was obtained, the mutant types being classified as olive, light, sterile, and restricted, the first group being the most stable.

Isaac (I.). **Gliocladium roseum Bain., and its synonyms.**—*Trans. Brit. mycol. Soc.*, 37, 3, pp. 193–208, 6 figs., 4 graphs, 1954.

A comparative study at University College, Swansea [cf. *R.A.M.*, 33, p. 545], of *Verticillium foëxii*, *V. pulverulentum*, a variant of each, *V. rhizophagum*, *Gliocladium roseum* (all from the Centraalbureau voor Schimmelcultures, Baarn), *G. roseum* from the Commonwealth Mycological Institute, and an unidentified soil fungus from an experimental plot at Swansea revealed that all should be referable to a single species. All produce both verticillate and penicillate conidiophores and the conidia, enveloped in mucilage, are abstricted from the apices of the phialides. The mycelium forms into 'ropes' when it develops subaerially, but otherwise remains simple and produces hyaline sclerotial- and chlamydospore-like bodies. Optimum growth was secured on a maltose medium containing sodium nitrate at a temperature of 25° C. and pH 6·4 to 8.

None of the isolates was pathogenic to any of a wide range of plants normally susceptible to *Verticillium*. It is concluded that all the species represented by the isolates should be considered as synonyms of *G. roseum*.

Thompson (G. E.). **The perfect stages of Marssonina rhabdospora and Septogloeum rhopaloideum.**—*Mycologia*, 46, 5, pp. 652–659, 11 figs., 1954.

Studies carried out at the Department of Botany, University of Toronto, and at the Department of Plant Pathology, Cornell University, Ithaca, New York, on the life-histories of *Marssonina rhabdospora* and of *Septogloeum rhopaloideum* [*R.A.M.*, 32, p. 156] are described.

M. rhabdospora is associated with a brown spotting of the living leaves of *Populus grandidentata* and *P. tremuloides* in North America. When leaves of *P. tremuloides* bearing acervuli with conidia were collected in autumn and wintered out of doors, beaked, pyriform perithecia developed, measuring 128 to 160 by 160 to 220 μ. The

beaks arose laterally and protruded through the leaf, attaining a length of 250 μ. The fusiform asci measured 144 to 217 by 16 to 19 μ, and the triseptate, hyaline ascospores, constricted at the middle septum, were 48 to 70 by 3·5 to 4 μ. These features are characteristic of the genus *Pleuroceras* [cf. 31, p. 89], the only previously described species of which found on poplar leaves is *P. cryptoderis*. This occurs on *Populus alba* in Europe, and the ascospore measurements are 42 to 44 by 3 μ. The perfect state of *M. rhabdospora* is, therefore, regarded as a new species and is named *Pleuroceras populi*.

The perfect state of *S. rhopaloideum*, associated with a leaf spot of *Populus tremuloides*, one collection of which was labelled 'on *P. balsamifera*', was characterized by depressed-globose, almost black perithecia measuring 114 to 152 by 95 to 114 μ. The clavate-cylindrical, 8-spored asci measured 70 to 112 by 16 to 19 μ. The elliptical to oblong, straight or slightly curved, hyaline, unicellular, biseriate ascospores measured 22 to 33 by 6·5 to 8 μ. This state is named *Guignardia populi* n.sp.

Townsend (Brenda B.) & Willetts (H. J.). **The development of sclerotia of certain fungi.**—*Trans. Brit. mycol. Soc.*, 37, 3, pp. 213–221, 3 figs., 1954.

In the Department of Botany, University of Bristol, the development of the sclerotia of six fungi was studied and three different methods of formation were distinguished [*R.A.M.*, 28, p. 84]. Sclerotial initials of *Rhizoctonia* [*Corticium*] *solani* develop by the increased branching and septation of the ordinary hyphae. The mature sclerotia are constructed rather loosely of brown, barrel-shaped cells with dense contents. Those of *Botrytis allii*, *B. cinerea*, and *Sclerotium cepivorum* develop terminally by the repeated dichotomous branching of a hyphal tip followed by increased septation and fusion of the branches. In *S. rolfsii* and *Sclerotinia gladioli* the mycelial branches coalesce to form sclerotia.

Townsend (Brenda B.). **Morphology and development of fungal rhizomorphs.**—*Trans. Brit. mycol. Soc.*, 37, 3, pp. 222–233, 4 figs., 1954.

In the Department of Botany, University of Bristol, the rhizomorphs of 16 basidiomycetes were classified into the following four groups: (*a*) largely undifferentiated (*Hymenogaster luteus*, *Merulius lacrymans*), (*b*) with concentric zones of similar hyphae arranged differently (*H. tener*, *Collybia platyphylla*), (*c*) with zones of hyphae of different sizes (including *Flammula sapinea*, *Psalliota campestris*, *P. arvensis*, and *Hysterangium nephriticum*), and (*d*) some hyphae having thickened walls (including *Armillaria mellea* and *Marasmius androsaceus*).

A. mellea has two types of rhizomorphs [*R.A.M.*, 32, p. 332]; hard, brown or black, cylindrical or flattened strands, formed in the soil or on or near the surface of decaying tree trunks or branches, and softer, white, flattened strands, formed within the wood of infected trees or deep in culture media. They grow best in a humid atmosphere in darkness at a temperature of 25° C. and pH 5·6. The range at which rhizomorphs develop (pH 3·6 to 8) is slightly narrower than that permitting mycelial growth (pH 3·1 to 8·8). The carbon-nitrogen ratio affected rhizomorph formation in a way similar to sclerotial development [see preceding abstract]; a ratio of three to five parts of glucose to one of either peptone or asparagine appeared the most favourable [32, p. 332].

Flaig (W.) & Kutzner (H. J.). **Zur Systematik der Gattung Streptomyces.** [On the systematics of the genus *Streptomyces*.]—*Naturwissenschaften*, 41, 12, p. 287, 1954.

According to the colour of the aerial and submerged mycelia and the pigment on oatmeal agar [see next abstract], 1,600 isolates of *Streptomyces* from various soil types were divided into nine groups in preliminary studies at the Institute for Soil

Biochemistry of the Agricultural Research Institute, Braunschweig-Volkenrode, Germany [cf. *R.A.M.*, 32, p. 613; 34, p. 62]. A further subdivision within these main groups was made on the basis of the cultural, morphological, and physiological reactions of the strains on various media.

Küster (E.) & Grein (A.). **Vergleichende Untersuchungen zur Systematik der Streptomyzeten.** [Comparative studies on the systematics of the Streptomycetes.]—*Naturwissenschaften*, 42, 2, p. 52, 1955.

A comparison was made of two media in current use for the culture of streptomycetes, viz., oatmeal agar (employed at the Agricultural Research Institute, Brunswick) [see preceding abstract] and potato agar (the standard substratum at the Institute of Plant Pathology, Milan). Both media appeared to be equally well adapted for the systematic study of the organisms, the only difference in an investigation of 37 specifically designated strains being a tendency towards the predominance in potato agar cultures of shorter and more distinctly undulating and curved aerial hyphae, as seen through the electron microscope. The spore forms were identical in both series.

Loos (C. A.). **Studies in blister blight control XIII. Methods of fungicidal application in the control of the blister blight disease of Tea.**—*Tea Quart.*, 25, 2, pp. 5 [29]–13 [37], 1954.

The final experiment in this series [cf. *R.A.M.*, 34, p. 186] was concerned with tests of the relative efficiency and costs of portable equipment for the fungicidal control of tea blister blight [*Exobasidium vexans*] in Ceylon. At Meddecoombra on ten-day plucking rounds from 1st May to 30th September, 1953, during the south-west monsoon a comparison was made of (A) spraying 185 acres with Shell copper fungicide (4 oz. in 10 gals. water at approximately 15 gals. per acre every nine to ten days) by means of the Vermorel pressure-retaining knapsack fitted with the American double swivel nozzle with two OC–O2 jets for treating two rows simultaneously; (B) dusting 250 acres in five row bands with cuprosana (4 per cent. dust at 5 lb. per acre every five days) by means of Orient rotary hand dusters, and (C) mist-blowing 233 acres in five row bands with Shell copper fungicide (6 oz. to 1 gal. at 1 gal. per acre and nine- to ten-day intervals) by means of the Duiker mist-blower. For the protection of 500 acres 17 sprayers, 16 dusters, or ten mist-blowers would be required.

In September, when the disease had gained a hold, the mist-blown areas had the highest incidence of blight and the sprayed areas the least. The total cost per acre per annum and cost per lb. made tea (assuming a crop of 750 lb. made tea per acre per annum) worked out at (A) Rs. 47·26 and Cts. 6·3, (B) Rs. 106·12 and Cts. 14·15, and (C) Rs. 49·57 and Cts. 6·61 for the three treatments, respectively. A second set of figures was obtained assuming eight-day plucking rounds. The treatments were otherwise similar. They would require 20 sprayers, nine dusters, or 11 mist-blowers, the corresponding costs being Rs. 57·43 and Cts. 7·66; Rs. 65·89 and Cts. 8·78; and Rs. 58·66 and Cts. 7·82, respectively.

Shell copper fungicide (6 oz. to 1 gal.) applied at 1 to 1¼ gals. per acre by means of a modified Duiker mist-blower over 200 acres of tea on the Ragalla estate varying in age from 15 to 56 months from pruning gave good protection in a season generally favourable to blister blight. However, the machines require a high standard of maintenance and are not recommended for use on rough or steep country.

Wang (T.-Y.) & Commoner (B.). **Auxiliary infectious nucleoprotein from plants infected with Tobacco mosaic virus.**—*Science*, 120, 3129, pp. 1001–1004, 1 fig., 2 graphs, 1 diag., 1954.

In further studies at the Henry Shaw School of Botany, Washington University,

St. Louis, Missouri, on leaves infected by tobacco mosaic virus [*R.A.M.*, 33, p. 265] the authors, comparing the insoluble nucleoprotein components of infected and uninfected tobacco leaves, isolated a previously unknown, infectious, buffer-insoluble nucleoprotein consistently associated with infection and possessing, apparently, biological properties indistinguishable from those of the virus. If the washed residue left after removal of the phosphate-soluble proteins in homogenized infected leaf tissue is extracted in 10 per cent. sodium chloride for 18 hours at 4° C., about 15 per cent. of the previously insoluble protein and almost all the nucleic acid dissolve. A prominent component of this extract, not found in healthy material, herein designated I 8, has an electrophoretic mobility of −8·5. Both I 8 and tobacco mosaic virus were shown by electron micrographs to be rods averaging about 450 μ in length. It was not possible to resolve mixtures of the two proteins electrophoretically and there was a close immunochemical relationship between the two. Evidence obtained demonstrated that I 8 is a pentose-nucleoprotein differing from tobacco mosaic virus with respect to amino acid composition and, possibly, with respect to nitrogen base ratios. No significant difference was established in the specific infectivity of the two nucleoproteins.

Cooper (W. D.) & Loring (H. S.). **The purine and pyrimidine composition of the Tobacco mosaic virus and the Holmes masked strain.**—*J. biol. Chem.*, 211, 2, pp. 505–515, 1954.

At the Department of Chemistry, Stanford University, Stanford, California, the examination of trichloroacetic acid and alcohol-ether extracts of tobacco mosaic virus for acid-soluble and phospholipide compounds failed to reveal them in significant quantities. In agreement with Knight's conclusion [*R.A.M.*, 31, p. 518] no significant difference was detected between tobacco mosaic and Holmes's masked strain of the virus on the basis of purine and pyrimidine components. Tobacco mosaic virus nucleic acid prepared by heat denaturation yielded purine and pyrimidine values almost identical with those found for the virus nucleoprotein extracted by trichloroacetic acid and alcohol-ether. The results for virus nucleic acid prepared by alkali extraction showed significantly lower uridylic acid concentrations.

Grushevoi (S. E.). Хлоротическая кольцевая пятнистость листьев Табака. [Chlorotic ring spot on Tobacco leaves.]—Табак [*Tobacco*], 15, 4, pp. 37–38, 1954.

A chlorotic ring spot of unknown origin on tobacco leaves, differing from tobacco ring spot virus [*R.A.M.*, 24, p. 400] in that the chlorotic patterns, later becoming necrotic, take the form of sinuous lines (nursery plants) or numerous whitish-green rings (in the field) along the midrib instead of on the lateral veins, is reported from the Yalta region, U.S.S.R. It was first noticed in 1952 on nursery and hot-bed plants, particularly those adjacent to wild vegetation, and in some isolated instances in the field. Infection was higher in 1953, affecting up to 12 per cent. of the plants in some fields, particularly on plants from nurseries and hot-beds that had been infected in the previous season, indicating that the disease is of an infectious nature (possibly of virus origin) and may become serious. The growth of the affected plants is somewhat retarded. The usual control measures against virus diseases are recommended, especially the destruction of all infected plants, particularly those in hot-beds.

Silberschmidt (K.), Rostom (E.), & Mattos Ulson (C.). **A strain of Potato-virus Y inducing local and systemic necrotic spots on leaves of Tobacco White Burley.**—*Amer. Potato J.*, 31, 7, pp. 213–217, 2 figs., 1954.

Sap from a *Solanum* sp. with crinkled leaves collected in Paranapiacaba (Serra

do Mar), Brasil, induced small, round, yellow, chlorotic spots on the inoculated and younger leaves of White Burley tobacco, frequently accompanied by stunting of the plant and veinbanding of the younger leaves. Veinbanding and crinkling were also induced on *Nicotiana glutinosa*, whereas *Datura stramonium* showed no symptoms.

The thermal inactivation point is between 55° and 60° C. Viruliferous *Myzus persicae* aphids, after an acquisition feeding period of 5 minutes, produced round yellow spots in 100 per cent. of the tobacco plants to which they were transferred. The causal virus is supposed to be a (possibly necrotic) strain of potato virus Y [cf. *R.A.M.*, 30, p. 578; 33, p. 73].

Heggested (H. E.) & Clayton (E. E.). **Control of Tobacco wildfire with streptomycin sulphate.**—*Plant Dis. Reptr*, 38, 9, pp. 661–665, 1 fig., 1954. [Multilithed.]

In experiments conducted by the Tobacco Experiment Station, Greeneville, Tennessee, and the Field Crops Research Branch, Beltsville, Maryland, four sprays at weekly intervals of streptomycin sulphate (200 and 400 p.p.m., 10 gals. per 100 sq. yds.) gave good control of tobacco wildfire (*Pseudomonas tabacum*) [*R.A.M.*, 32, p. 455], resulting in a disease index (100 = all leaves destroyed) on plants with normal buds of 0·6 to 1·1, as against 35·8 for Bordeaux mixture, 53·7 for fixed copper, and 62 for the untreated. The antibiotic appeared to be effective both as a protectant and an eradicant and improved the root systems of treated plants.

Tomato diseases and their control.—*J. Dep. Agric. Vict.*, 52, 12, pp. 573–574, 576, 2 figs., 1954.

The final instalment of this series [cf. *R.A.M.*, 33, p. 644] includes notes on the characteristics and avoidance of various non-parasitic disorders of tomatoes, among them blossom-end rot [32, p. 189], caused by an inadequate supply of water to the fruit, which is very common in northern districts of Victoria, and upward rolling of the leaves observed during periods of heavy rainfall or following severe pruning.

Doolittle (S. P.). **The use of wild Lycopersicon species for Tomato disease control.**—*Phytopathology*, 44, 8, pp. 409–414, 1954.

Reference has already been made in this *Review* to most of the 44 papers on the use of wild species of *Lycopersicon* in breeding tomatoes for resistance to a number of important diseases [*R.A.M.*, 32, p. 700; 34, p. 189] cited in the author's contribution to the Symposium on Agricultural Research in the Western Hemisphere at Madison, Wisconsin, on 9th September, 1953.

Caldwell (J.). **The movement of Tobacco mosaic virus in the Tomato.**—*New Phytol.*, 54, 1, pp. 89–94, 1955.

The author notes and discusses current views on the method of the movement of tobacco mosaic virus within a tomato plant [*R.A.M.*, 29, p. 179]. The suggestion of Samuel [13, p. 476] that movement is always slowly upward after a rapid movement to the roots of infected plants is considered in the light of Kunkel's later observations [18, p. 823]. These do not appear to support either his own conclusions or Samuel's hypothesis. The writer's own experiments show that initial movement may be upward or downward or more usually in both directions, and the virus can be detected in all intervening parts. He concludes that the evidence strongly suggests the movements to be through living cells and more rapid when these are in an active metabolic stage, possibly embryonic on occasion.

Green (R. J.). **A preliminary investigation of toxins produced in vitro by Verticillium albo-atrum.**—*Phytopathology*, 44, 8, pp. 433–437, 3 graphs, 1954.

A preliminary account of this work at Purdue University, West Lafayette, Indiana, on the reactions induced in Bonny Best tomato cuttings by culture filtrates of *Verticillium albo-atrum* has been noticed previously [*R.A.M.*, 33, p. 692]. Precipitation of the toxic fractions from culture filtrates with 95 per cent. ethyl alcohol destroyed their activity, host responses observed in the presence of resuspended precipitate being attributed to mechanical occlusion.

Selective precipitation methods and other analytical procedures indicated the occurrence in the filtrate from 30-day cultures of the fungus of a proteinaceous and a polysaccharide fraction. The proteinaceous substance appeared to be responsible for wilting, chlorosis, and desiccation, the polysaccharide causing vascular discoloration and gummosis only in the absence of the protein.

Excessive accumulation of nitrite ions in the culture was transient and did not coincide with the maximum wilting activity of the filtrate. A comparison of the normal growth curve of *V. albo-atrum* and the time of toxin production showed that autolysis of the elaborated cells had begun before any toxic activity could be demonstrated by the behaviour of the test cuttings. From the evidence adduced it seems unjustifiable to assume that the toxins synthesized *in vitro* by the pathogen are responsible for the symptoms developing in plants under conditions of natural infection.

Axelsson (F.). **A new F_1-variety of Tomato resistant to Cladosporium.**—*Agri hort. genet., Landskrona*, 12, 3–4, pp. 191–201, 1954. [German summary.]

Breeding experiments which have been in progress in Sweden since 1935 to produce an F_1 tomato variety resistant to *Cladosporium fulvum* [cf. *R.A.M.*, 33, p. 566] culminated in 1954 with the release for the market of W:s Immuna. This early, prolific, and otherwise desirable variety is derived from the resistant *Lycopersicon pimpinellifolium*. E. A. Kerr reports from Vineland Station, Ontario, Canada, that Immuna withstands infection by physiologic races 1 and 9 of the fungus but is attacked by 5 and 8 [34, p. 111]. In hothouse tests at two Swedish experiment stations from 1950 to 1953, inclusive, it outyielded the standard Potentate variety on an average by 12 per cent., Scania by 16 per cent., and Selandia by 25 per cent. During the first fortnight of harvesting the yields of Immuna were 90 per cent. heavier than those of Potentate and after a month 43·5 per cent. more. In Norway under comparable conditions in 1954 Immuna was 69, 71, and 85 per cent. more productive than Potentate, Scania, and Selandia, respectively, during the early stages of harvesting. In a cold greenhouse, too, Immuna remained free from leaf mould, as also did W:s Danderyd and the Norwegian Kvithammar, while five other varieties were severely infected. The new variety is, however, susceptible to magnesium deficiency [cf. 32, p. 41].

Naef-Roth (Stephi) & Reusser (P.). **Über die Wirkung der Fusarinsäure auf den Gaswechsel von Tomaten-Blattgewebe.** [On the effect of fusarinic acid on the gas exchange of Tomato leaf tissue.]—*Phytopath. Z.*, 22, 3, pp. 281–287, 5 graphs, 1954.

At the Federal Technical Institute, Zürich, Switzerland, synthetic fusarinic acid (5n-butyl-picolinic acid) [see above, p. 250] inhibited the respiration of excised Tuckswood tomato leaf tissue, the intake of oxygen and the emission of carbon dioxide being equally affected. The action of the toxin was strongest at pH 4·8 and weakest at 7. Respiration was influenced in the same way by synthetic picolinic acid.

Fergus (C. L.). **An epiphytotic of Phyllosticta leaf spot of Maple.**—*Plant Dis. Reptr*, 38, 9, pp. 678–679, 3 figs., 1954. [Multilithed.]

Outbreaks of *Phyllosticta minima* were severe on red maple (*Acer rubrum*) but less so on hard maple (*A. saccharum*) [cf. *R.A.M.*, 24, p. 5] in north-western Pennsylvania in the spring of 1954. On red maple the leaf spots were irregularly circular, at first dark brown, then with a pale centre and darker margin, coalescing to form large, irregular, necrotic areas. Of the 47 collections of *P. minima* from Pennsylvania in the University Herbarium, State College, 36 were on *A. rubrum*, six on *A. saccharum*, and two on *A. saccharinum*.

Boyce (J. S.). **Mat formation by the Oak wilt fungus on felled versus standing trees.**—*Plant Dis. Reptr*, 38, 9, pp. 676–677, 1954. [Multilithed.]

Observations on the development of oak wilt (*Endoconidiophora fagacearum*) [*Chalara quercina*: *R.A.M.*, 34, p. 114] in North Carolina indicated that on wilting trees that were felled and cut into logs during the summer, mycelial mat formation occurred only during autumn of the same year, the mats disintegrating by the following spring, while infected trees that were left standing produced mats in the spring. Since infection occurs mostly in the spring [33, p. 326] summer felling alone, without further treatment, may reduce the spread of the disease.

Rhoads (A. S.). **The occurrence of Clitocybe root rot on Tung trees in India doubtful.**—*Plant Dis. Reptr*, 38, 9, pp. 638–639, 1954. [Multilithed.]

The author expresses doubt as to the certainty of the occurrence of *Clitocybe tabescens* on tung trees (*Aleurites fordii*) in India [*R.A.M.*, 29, p. 588; 32, p. 650], there being no definite statement concerning locality in Prasad's original paper [29, p. 588].

Banerjee (S.) & Mukherjee (N.). **Effect of moisture-content of the fructification on sporulation and spore-discharge in Marasmius campanella Holterm.**—*Sci. & Cult.*, 20, 3, pp. 138–140, 1 fig., 1954.

Details are given of experiments carried out in the Department of Botany, University of Calcutta, on the variations in spore discharge from fresh fructifications of *Marasmius campanella* from *Lagerstroemia speciosa* [*R.A.M.*, 34, p. 192] under different conditions. Spore discharge starts when the moisture content is about 79 to 83 per cent. and continues until it falls to 48·5 to 56·4 per cent. Above or below these levels there is no discharge. Under normal conditions spores are given off for 24 to 32 hours.

Gilmour (J. W.). **Armillaria mellea (Vahl) Sacc. in New Zealand forests. Part 1. In stands of Pinus radiata D. Don in Kaingaroa State Forest.**—*For. Res. Notes, N.Z.*, 1, 9, 40 pp., 8 pl., 1954. [Mimeographed.]

The information in this bulletin has already been noticed from another source [*R.A.M.*, 33, p. 328 and next abstract].

Annual Report of the Forest Research Institute (New Zealand Forest Service) for the year ended 31st March, 1954.—*For. Res. Notes, N.Z.*, 1, 11, 30 pp., 1954. [Mimeographed.]

It is stated in this report [cf. *R.A.M.*, 33, p. 328] that *Armillaria mellea* attacked a third of the pine trees (*Pinus radiata*) [see preceding abstract] in one plot planted in 1948 on a cut-over eucalyptus area; it killed 19 trees in the 1953–4 season and nine previously. *Lophodermium pinastri* [cf. 32, p. 526] was severe in the central North Island, particularly on *P. radiata*, causing fall of all but the current year's needles in some cases, especially in valleys and on firebreaks. *L. pinastri* was also

responsible for the heavy mortality among shaded trees of dense young regeneration, which, however, proved beneficial to the remaining trees.

Diller (J. D.) & Huang (S. W.). **An experiment in growing Merulius lacrymans and Poria incrassata under root-cellar conditions.**—Abs. in *Phytopathology*, 44, 7, p. 388, 1954.

An experiment was designed to ascertain the rate of progress of *Merulius lacrymans* and *Poria incrassata* [see next abstract] in bolted paired members, 8 ft. by 4 in. by 2 in., of oak (*Quercus alba* or *Q. rubra*), pine (*Pinus taeda*), and Douglas fir (*Pseudotsuga menziesii*) [or *P. taxifolia*] set vertically in a cellar in pails of infected soil, and to determine the natural resistance of the wood. During a period of $2\frac{1}{2}$ years both organisms advanced at about the same rate in all the woods, though infection started later in *P. taxifolia* than in oak and pine. At the time of writing none of the infections had reached a height of 8ft. Both fungi appear to be more active in the spring and summer than during the autumn and winter.

Diller (J. D.) & Koch (E. J.). **Experience in growing Merulius lacrymans and Poria incrassata under forest conditions.**—Abs. in *Phytopathology*, 44, 7, p. 388, 1954.

The outdoor culture of the house fungi *Merulius lacrymans* and *Poria incrassata* [see preceding abstract] presents considerable difficulty, but 100 inoculants of each species have recently been established in a wooded area [in the United States] by the use of leaves and asphalt-saturated felt paper as insulating materials to maintain high relative humidity and favourable temperatures. After six months the percentage of decay, measured by loss of weight, in 8 by 2 in.-wedges of 40 durable species of wood ranged from 0 to more than 50.

Graham (R. D.). **The pressure treatment of Western Larch pole sections with pentachlorophenol solutions.**—*J. For. Prod. Res. Soc.*, 4, 3, pp. 126–130, 1954.

The relationship between penetration, total retention, and sapwood retention of preservatives in the treatment of poles is discussed, prior to a report on experiments on the pressure treatment of western larch [*Larix occidentalis*] poles with three pentachlorophenol solutions [cf. *R.A.M.*, 34, p. 119] at the Oregon Forest Products Laboratory, Corvallis. It is concluded that the maximum practicable sapwood retention in this wood is 22 lb. per cu. ft. and complete sapwood penetration may be expected over a wide range of sapwood retentions, while there is virtually no radial penetration of the heartwood. Excessive retention occurred in the sapwood if treatment specifications based on a total retention of 6 lb. per cu. ft. were used. The Lowry process [32, p. 50] gives good results with western larch poles.

It is recommended that a suitable sapwood retention is 16 lb. per cu. ft. with total retentions of 6 and 4 lb. for large and small poles, respectively, and a minimum sapwood penetration of 0·4 in. for a satisfactory treatment.

Supplement: Wood preservation.—*Wood*, 19, 6, pp. 245–263, 17 figs., 3 diags., 1954.

The uses of preservative-treated timber in public buildings, housing, agriculture, packaging, and industries, including communications and mines, are briefly reviewed, with notes on the most suitable treatment for each type of work. The hazards of dry rot [*Merulius lacrymans*: *R.A.M.*, 33, p. 61] in buildings are outlined together with methods of prevention and control.

A note is also given (p. 264) on a new pressure impregnation plant erected at North Shields, Northumberland, and capable of dealing with 2,500 cu. ft. timber per day. It will operate exclusively with celcure wood preservative.

Heiks (R. E.), Blum (S. E.), & Burch (J. E.). **Toxicity of β,β′-oxydipropionitrile soluble and insoluble fractions of creosote and petroleum oils to wood-destroying fungi by the soil-block method.**—*J. For. Prod. Res. Soc.*, 4, 3, pp. 123–126, 3 graphs, 1954.

At the Battelle Memorial Institute, Columbus, Ohio, it was shown that the fractions of creosote and petroleum oils soluble in β,β′-oxydipropionitrile (ODPN) are much more toxic to *Lentinus lepideus* [*R.A.M.*, 33, p. 697] as measured by the soil-block test with unweathered, impregnated wood blocks [loc. cit.] than the ODPN-insoluble fraction or the whole oil. The threshold retention values of the ODPN-soluble fractions from both coal-tar and petroleum are nearly the same, ranging from 1·3 to 2·5 lb. per cu. ft., but far more of the toxic fraction is present in coal-tar oils.

Scheffer (T. C.) & Browne (F. L.). **Tests of some superficial treatments of exposed wood surfaces for their protection against fungus attack.**—*J. For. Prod. Res. Soc.*, 4, 3, pp. 131–132, 1954.

During the war, tests were carried out at the Forest Products Laboratory, Madison, Wisconsin, to determine the effectiveness of wood preservation by superficial treatments using preservatives (10-second dip), sealers (slow dip), and water repellents (10-second dip), primarily for timber structures in aeroplane wings. Test slabs $\frac{1}{4}$ by 1 by 3 in. of Sitka spruce heartwood and $\frac{3}{16}$ by 1 by 3 in. sweetgum [*Liquidambar styraciflua*] sapwood (in the form of plywood) were treated with two preservatives, 2 per cent. pentachlorophenol plus chloro-2-phenyl-phenol in mineral spirits, and 5 per cent. pentachlorophenol in mineral spirits; two sealers, paraphenyl phenol-formaldehyde resin varnish in thinners, and ester gum varnish in thinners; and a water repellent, consisting of methyldihydroabietate (7·5 per cent.), 7·5 per cent. paraffin wax, and 7 per cent. pine oil in mineral spirits, all in various combinations. Six weeks after treatment the slabs were exposed to two sets of severe conditions, (1) buried in garden soil kept damp or exposed to pure cultures of the wood-rotting fungi *Poria monticola* [*R.A.M.*, 33, p. 392], for the softwood, and *Polyporus* [*Polystictus*] *versicolor* [loc. cit.], for the hardwood, and (2) kept at a relative humidity in excess of 95 per cent.

Maximum protection against decay (measured by percentage loss in dry weight) was afforded by the application of either preservative followed by a preservative in a sealer, or the repellent plus preservative followed by a preservative in a sealer. The use of a sealer alone was ineffective, but moderate protection was given by incorporating a preservative in the sealer.

Theden (Gerda) & Becker (G.). **Holzschutz-Grundlagen, Begriffe-Erläuterungen und Bemerkungen zum Normblatt DIN 52175.** [Wood protection—principles, concepts. Explanations and remarks on the standard leaflet DIN 52175.]—*Holzzentralbl.*, 80, 54, pp. 671–672, 1 fig., 1954.

Information on current methods of wood preservation and the principles underlying them is supplied in the form of explanatory comments on the new German standard leaflet DIN 52175 of April, 1954.

Schulze (B.). **Zur Haltbarkeit (Lagerbeständigkeit) anorganischer im Holzschutz verwendeter Fluorverbindungen.** [On the permanency (stability in storage) of inorganic fluorine compounds used in wood protection.]—*Holzforschung*, 9, 1, pp. 18–20, 1 graph, 1955. [English summary.]

At the Laboratory for Wood Preservation Technology, Berlin, the reactions of some of the solid fluorides used as wood preservatives were tested under different storage conditions. The assay involved weighing samples stored at 40° C. at varying

atmospheric humidity and also at a constant relative humidity of 18 per cent. for periods up to six months. Further, the volatile fluorine compounds from the salts were absorbed by a calcium chloride solution and a gravimetric analysis was made of the calcium fluoride so formed. The results showed that the hydrogen fluorides, especially ammonium hydrogen fluoride, are more hygroscopic and release their volatile components more readily than the fluosilicates.

The practical application of experimental data should be made under highly exacting conditions, using small quantities of salts in open storage. Properly packed, the fluosilicates and hydrogen fluorides should be storage-proof. In fact, after five years the fluorine contents of 12 samples of 'WB4' (a commercial mixture of hydrogen fluorides) in their ordinary packings were found to have scarcely decreased.

Schmidt (Trude) & Böhm (O.). **Übersicht über die wichtigsten Krankheiten und Schädlinge unserer Gemüsekulturen.** [Survey of the most important diseases and pests of our vegetable crops.] —*Pflanzenarzt*, 7, 12, pp. 1–13, 1954.

Included in this annotated list of well-known vegetable diseases in Austria [cf. *R.A.M.*, 33, p. 523 *et passim*] are anthracnose (*Colletotrichum lindemuthianum*) and *Pseudomonas* [*medicaginis* f. sp.] *phaseolicola* on bean [*Phaseolus vulgaris*]; leaf and pod spot of pea caused by *Ascochyta pisi*, *Mycosphaerella pinodes*, and *A. pinodella*; *Bremia lactucae* on lettuce; *Tuburcinia* [*Urocystis*] *cepulae*, *Peronospora schleideni* [*P. destructor*], and *Botrytis allii* on onion; *Septoria lycopersici* on tomato; and *Puccinia asparagi* on asparagus.

Bremer (H.) & Herold (F.). **Botrytis-Erkrankungen an Gemüsepflanzen im feuchten Sommer 1954.** [*Botrytis* diseases of vegetable plants in the humid summer of 1954.]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), *Stuttgart*, 7, 1, pp. 8–10, 3 figs., 1955.

The damp, cold summer of 1954 favoured the development of *Botrytis cinerea* on vegetables in the Neuss–Lauvenburg district of Germany [*R.A.M.*, 6, p. 501]. On tomato fruits [cf. 17, p. 633] infection was not eliminated by any of the copper, zinc carbamate, thiram, and captan preparations applied for the control of *Phytophthora* [*infestans*]. The primary leaves of both kidney and runner beans [*Phaseolus vulgaris* and *P. coccineus*] were severely attacked and many young plants collapsed, though others recovered completely and the pale, angular spots with necrotic centres resumed a normal green colour. *B. cinerea* also played an important part in the spotting and dying-off of asparagus shoots, which was particularly severe in a field surrounded on three sides by a wood, while heavy nitrogenous soil amendments no doubt enhanced the predisposition to infection.

Skene (J. K. M.) & Kefford (R. O.). **Manganese deficiency in vegetable crops. Part 2—Plant and soil investigations.**—*J. Dep. Agric. Vict.*, 53, 1, pp. 13–22, 6 figs., 1954.

Plot trials to test the effect of applying manganese in various forms to vegetable crops in the Melbourne metropolitan area, Victoria [*R.A.M.*, 34, p. 198], were set out from 1950 to 1952. During 1950–51 the untreated Brussels sprouts and cabbage plots and those receiving less than 100 lb. manganese sulphate per acre developed severe interveinal mottling and bleaching. No symptoms appeared in Savoy cabbage on plots receiving 600 lb. manganese sulphate or 10 cwt. of the reducing agent sodium hyposulphite, nor in cabbage and sprouts receiving soil dressings of 10 cwt. sulphur or 100 lb. manganese sulphate per acre or 1 per cent. manganese sulphate spray at 100 gals. per acre. The last-named needed to be applied repeatedly, however, for a lasting improvement.

In December, 1951, the same plots, receiving no further treatment, were sown with red beet. No deficiency symptoms appeared where sulphur and manganese sulphate at 100 lb. per acre had been given, but they did at lower rates. Sowings on the untreated plots demonstrated the susceptibility to manganese deficiency of Brown Beauty [broad] beans, Greenfeast peas, Hollow Crown parsnips, Succession cabbages, and November Heading cauliflowers. Similar responses to treatment were recorded in a red beet trial in 1951–2. The only significant yield increases were with sulphur and 400 lb. per acre manganese sulphate and a double spray treatment (9 to 15 per cent. higher than the untreated). Some injury was caused by higher rates of application.

The deficiency may usually be suspected in crucifers and red beet containing less than 25 p.p.m. manganese in the dry matter of the leaves and in soils at North Narre Warren containing less than 20 p.p.m. available manganese after liming to above pH 6·3. Below this reaction 2 p.p.m. available manganese seems adequate for susceptible vegetables. The reaction may be maintained below pH 6·3 most cheaply by discontinuing lime and applying ammonium sulphate liberally. In general the deficiency is corrected by spraying the crops twice at an interval of two weeks with 1 per cent. manganese sulphate applied at 100 gals. per acre or by soil applications of 100 lb. per acre at North Narre Warren and 60 lb. on podsolic deep sand. Side dressings should be worked in carefully away from the plants to avoid injury.

Lüdecke (H.) & Nitzsche (M.). **Beitrag zur Frage nach dem Einfluss der Düngung auf Ertrag und Beschaffenheit der Zuckerrüben bei der virosen Vergilbung.** [Contribution to the question of the influence of manuring on yield and quality of Sugar Beets with virus yellows.]—*Zucker*, 7, 10, pp. 206–214, 1954.

Pot experiments conducted at the Institute for Sugar Beet Research, Göttingen, Germany, in 1950–1, indicated that excess applications of a complete fertilizer, or of phosphorus alone, increase sugar beet yields in virus yellows-infected areas. Excess phosphorus alone exerted a favourable influence on the composition of the roots, whereas comparable treatments with potassium [*R.A.M.*, 34, p. 70] increased not only the soluble ash but also the 'injurious' nitrogen content [33, p. 194].

Water consumption per gm. dry substance was found to be consistently higher in infected than in healthy beets, suggesting that irrigation might be advantageous in very dry seasons.

Labruyère (R. E.) & Riepma (P.). **De teelt van Erwten in verband met bodem, klimaat en plantenziekten.** [Pea cultivation in relation to soil, climate, and plant diseases.]—*Landbouwvoorlichting*, 11, 10, pp. 481–497, 6 figs., 1 map, 1954.

Information is presented on the following economically important diseases of peas in Holland: American wilt disease (*Fusarium oxysporum* f. *pisi* race 1) [*R.A.M.*, 32, p. 602 and next abstract]; another type of wilt occurring on sandy soils in Brabant, where the crop is extensively grown for canning, associated with a species of *Fusarium* differing from the foregoing and also from *F. o.* f. *pisi* race 2, the agent of 'near wilt'; foot rots [cf. next page] of various types yielding *Ascochyta pinodella* [31, p. 471], which is also consistently found in healthy plants, *Mycosphaerella pinodes*, and *F.* spp., including *F. oxysporum*, *F. solani* [see next abstract; 33, p. 63], and *F. avenaceum* [loc. cit.]; spotting of the aerial organs caused by *A. pinodella*, *M. pinodes*, and *A. pisi*; foot and pod rot due to *Botrytis cinerea* [31, p. 471]; and downy mildew (*Peronospora pisi*) [*P. viciae*: cf. 32, p. 233].

De Haan (H.). **The breeding of Peas in the Netherlands I. Round blue Peas.**—*Euphytica*, 3, 3, pp. 188–194, 1 graph, 1954. [Dutch summary.]

In this history of the breeding of round blue peas by Dutch breeders it is stated that the varieties Rondo, Parel, and Stijfstro, developed at the Plant Breeding Station 'Centraal Bureau', Hoofddorp, possess some resistance to foot rot caused by *Fusarium solani* [*R.A.M.*, 28, p. 619 and preceding abstract], while Vares is moderately resistant to wilt (*F. oxysporum* f. *pisi* race 1) [loc. cit.].

Drake (F. R.) & Kehoe (J. K.). **Response to molybdenum by Peas.**—*J. Dep. Agric. Vict.*, 52, 12, p. 570, 1 fig., 1954.

During the spring of 1953, Greenfeast pea plants on acid sandy loam in the Bairnsdale district of East Gippsland showing signs of nitrogen deficiency, even though sown with an adequate supply, responded well to applications of an ammonium molybdate solution ($\frac{1}{3}$ oz. in 2 gals. water) [cf. *R.A.M.*, 34, p. 202] before the podding stage. Plants which had received no nitrogen at sowing time were not improved.

Hungerford (C. W.) & Hillyer (I. G.). **Yellow Bean mosaic in Idaho.**—*Plant Dis. Reptr*, 38, 9, pp. 621–627, 5 figs., 1954. [Multilithed.]

At the University of Idaho Agricultural Experiment Station, Moscow, bean yellow mosaic virus [*R.A.M.*, 34, p. 201] from infected sweet clover plants was transmitted by carborundum rubbing to *Vicia villosa*, lupin (*Lupinus densiflorus*), *Crotalaria spectabilis*, *Medicago lupulina*, and alsike clover. Of the 26 horticultural varieties of peas tested, only Perfection [33, p. 651] and Gem proved resistant.

Quantz (L.) & Völk (J.). **Die Blattrollkrankheit der Ackerbohne und Erbse, eine neue Viruskrankheit bei Leguminosen.** [Leaf roll disease of the field Bean and Pea, a new virus disease of Leguminosae.]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), *Stuttgart*, 6, 12, pp. 177–182, 4 figs., 1954.

Further information is presented on the leaf roll virus disease of field and broad beans (*Vicia faba* vars. *minor* and *major*) and peas in Germany [*R.A.M.*, 34, p. 80], a prominent feature of which is the rigidity, chlorosis, and rolling (especially in field beans) of the leaflets. The disease is transmissible by the aphids *Acyrthosiphon onobrychis*, *Macrosiphum solanifolii* [*M. euphorbiae*], and possibly by *Myzus persicae* and *Megoura viciae*, but not by expressed sap. The virus, belonging to the persistent group, induces necroses in the phloem cells which stain red with fuchsin. It occurs naturally in vetch (*V. sativa*), *V. narbonensis*, lucerne, and *Pisum melanocarpum*. The recognition of the leaf roll virus in peas is of particular importance since the chlorotic symptoms are liable to confusion with those of foot rot [*Fusarium* spp., *Ascochyta pinodella*, *Mycosphaerella pinodes*, and *A. pisi*: 34, p. 122 and previous page].

Schnathorst (W. C.). **Effects of Sporotrichum sp. Link on Cowpea and four other leguminous hosts.**—*Phytopathology*, 44, 8, pp. 478–479, 1 fig., 1954.

At the University of Wyoming, inoculation experiments were performed by a method similar to that of Halpin *et al.* [*R.A.M.*, 31, p. 386] on soy-bean, *Melilotus officinalis*, *Phaseolus lunatus* var. *limenanus*, Black Valentine beans (*P. vulgaris*), and Blackeye cowpeas with potato dextrose agar cultures of a species of *Sporotrichum* isolated from dissected, surface-sterilized stems of Idaho certified beans. At temperatures of 75° and 85° F. the fungus was pathogenic to all the plants tested, the most conspicuous symptoms being produced on cowpeas, in 14 per cent. of which the growth habits of the radicle and epicotyl were inverted. Affected plants were usually the first to emerge. Other effects of the fungus at both temperatures on all hosts were severe stunting, abnormal enlargement of the radicle, rotting of the taproot tip, and reduced secondary root formation.

CONTENTS

AUTHORS' NAMES

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